Pit and Quarry
With which is consolidated
CEMENT-MILL & QUARRY
June 29, 1932

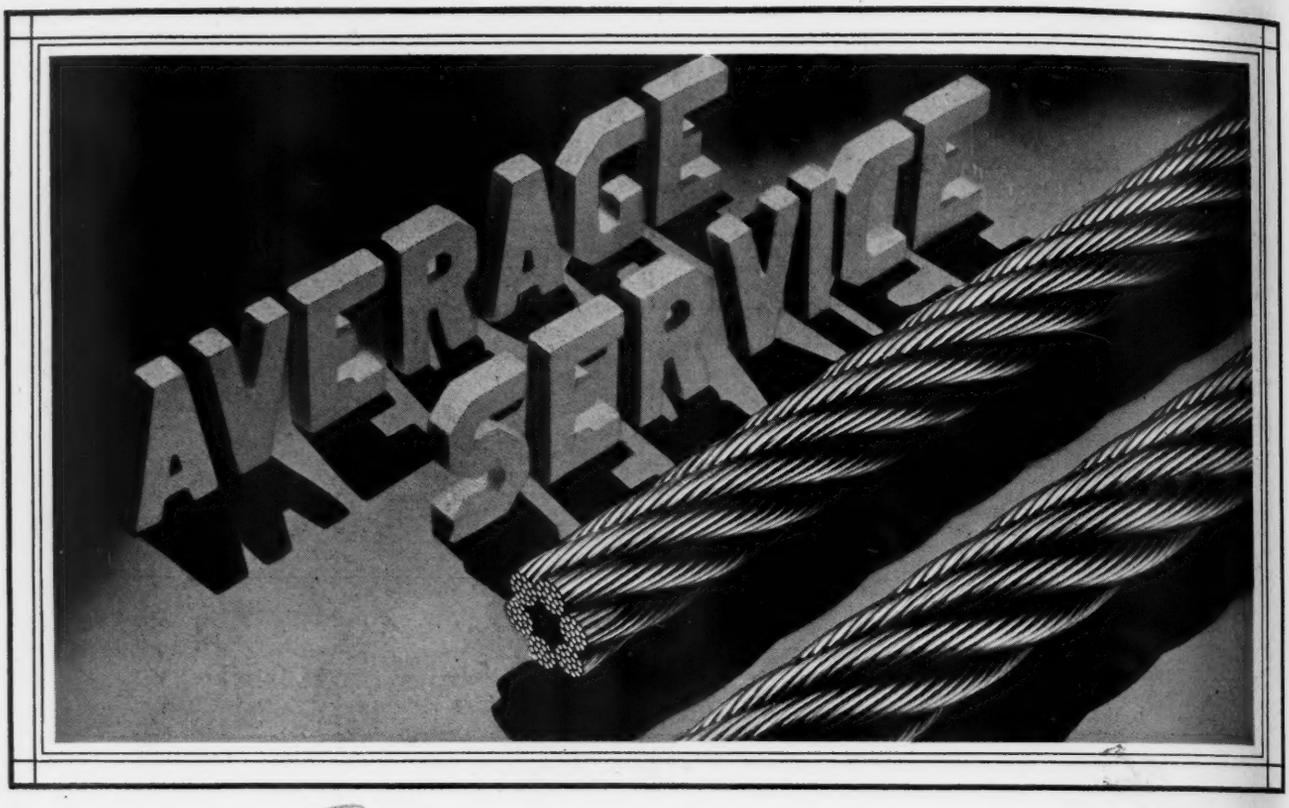
JUL 5 1932

The Railroads Have Their Way

It is almost thirty years since the ownership of a motor vehicle was accepted as a *prima facie* indication of wealth, yet Congress—behindhand in this as in everything else—apparently still considers the terms "motor-vehicle" owner and "rich man" synonymous. The plea that the revenue bill recently enacted should "soak the rich," having proved politically inexpedient, it was quickly converted into one for "soaking the motorist," with the result that more than one-fourth of the revenue expected to be collected—$300,000,000 of a total of $1,121,000,000—is demanded from present and prospective owners of motor trucks and cars. To the $150,000,000 expected to come from the federal gasoline tax of 1 cent a gallon must be added the $150,000,000 expected to be realized from sales taxes on lubricants, motor cars and trucks, parts, accessories, tires and tubes.

Many will be inclined to accept this as evidence of congressional stupidity, but we see behind it the sinister influence of the railroads, which are ever at work attempting to stifle every form of competition that hurts their interests. As we have often pointed out, the railroads are conspicuous examples of inefficiency in management and operation and, lacking the ability to renovate their methods, they are determined to saddle the country with the exorbitant costs of their own inadequacy by making the operation of alternative and superior transportation means almost impossible. Congressman Clancy of Michigan put his finger on the discriminatory nature of the bill when he said: "The revenue bill is very unfair in that it places three-fifths of the sales-tax burden on the automobile industry and does not place any sales taxes on the automobile's competitors, such as railroads, vessels, airplanes, motor-cycles, horses, buggies and wagons, and so forth. This shows the bill is strictly discriminatory. Indeed, it might very well have been written by the relentless competitors of the automobile industry and could not have been more drastic." The action of Congress indicates again that body's traditional subservience to the railroad interests, at the same time that it evidences the stupidity of those who expect to take such a large share of government taxes from a single industry without considering the inevitable effects of the law of diminishing returns.

The public is heartily sick of the mawkish sentimentality which has made the railroads the cry babies and spoiled children of industry. The ease with which most newspapers and some trade papers have been beguiled into supporting and defending the railroads, so evident in the simplicity of many of them, has greatly lowered the public's estimate of both the railroads and their gullible defenders. By their continued efforts to win a favoritism which they do not deserve the railroads are alienating a large share of the spirit of fairness that the public has heretofore felt for and shown them. This latest plan to make motor owners, through the revenue law, bear an unjust part of the general tax burden—in addition to the heavy levies imposed and often misapplied by the states—is the boldest and most onerous stroke of railroad scheming. We express the feeling of countless business men when we say that this is the proverbial "last straw." We look for no increase of sympathy for an industry that is so indifferent to the general interest.



A *Common-sense* BASIS for judging rope cost

Seldom is a rope user interested merely in the service given by a single wire rope. To the contrary, and particularly if he uses ropes in sizeable quantity, he is concerned about the performance of his ropes as a whole, about their *Average Service.*

This is at once the common-sense and most exacting basis for judging wire rope service cost. It is the basis advocated by Roebling, in which rope cost per ton of material handled, per mile traveled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.

Roebling Wire Ropes are made to give *uniformly* good service. No wire ropes, regardless of make or construction, will show lower general-average operating costs.

JOHN A. ROEBLING'S SONS COMPANY, TRENTON, N. J.

Wire · Wire Rope · Copper & Insulated Wires & Cables · Welding Wire · Flat Wire · Wire Cloth & Wire Netting

Atlanta Boston Chicago Cleveland Los Angeles New York Philadelphia
Portland, Ore. San Francisco Seattle Export Dept., New York, N. Y.

A plain statement about Wire Rope Economy

Roebling does not indulge in nor encourage sweeping claims of superior wire rope economy. Such claims, if generally made, would merely confuse the rope user. ¶ For the guidance of rope buyers, however, Roebling does assert that when gauged by the work performed, NO wire rope, regardless of make or construction, will show lower general average operating costs than Roebling.

Wire Rope for all purposes

The importance of selecting the right rope for each use cannot be too strongly emphasized. For no one rope will meet all requirements. ¶ Roebling makes wire rope of a great variety of types and designs, including Standard Right, Left, Lang, Preformed and Alternate Lays, in all degrees of rope and strand flexibility. ¶ The great stamina of all Roebling Ropes is primarily due to the quality of Roebling Wire. This Acid Steel Wire is renowned for its fatique resisting and wearing qualities. No better rope wire is produced. ¶ "BLUE CENTER" STEEL is the highest grade and is generally recommended for severe duty.

JOHN A. ROEBLING'S SONS COMPANY

WHY ALL WIRE ROPE WILL EVENTUALLY BE PREFORMED

Every wire rope will eventually be Preformed irrespective of its size, type, grade and construction because the Preforming process* eliminates the destructive internal stress which is inherent in *every* wire rope that is *not* Preformed.

Because of the fact that internal stress shortens the life of every *non*-preformed rope, it is my firm conviction that the Preformed process* will eventually be adopted by all wire rope manufacturers. What is more, every Preformed rope has the following additional advantages over every *non*-preformed rope of the same size, type, grade and construction:

1. Less internal friction.
2. Each strand carries its share of the load.
3. Less slippage.
4. Resists kinking.
5. Cuts without seizing.
6. Easier to handle.
7. Easier to splice.
8. Makes Independent Wire Rope Center practical.
9. Makes "Lang Lay" practical.

G. O. Moon
VICE-PRESIDENT

AMERICAN CABLE COMPANY, *Incorporated*
230 Park Avenue, New York, N. Y.
Manufacturers of TRU-LAY—the original Preformed Wire Rope

* *55 Wire Rope Manufacturers throughout the world are now licensed to manufacture Preformed Wire Rope under American Cable Company's patents.*

Pit and Quarry

With which is consolidated
CEMENT-MILL & QUARRY

Volume 24 June 29, 1932 Number 7

MEMBER AUDIT BUREAU OF CIRCULATIONS

Published bi-weekly on Wednesday for producers and manufacturers of Cement, Crushed Stone, Gypsum, Lime, Sand, Gravel and other nonmetallic minerals. Entered as second-class matter October 9, 1928, at the Postoffice at Chicago, Ill., under the Act of March 3, 1879.

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FOR THEIR LATEST AND BEST THEY CHOOSE THE LATEST AND BEST

THEIR latest improved design Western Portable Crushing and Screening Plants are equipped completely by the Western Wheeled Scraper Co., of Aurora, Ill., with Goodyear Transmission Belts specified to the drives by the G. T. M.— Goodyear Technical Man.

The main crushing plant drive is belted with Goodyear COMPASS Cord (Endless) and the screens are driven by Goodyear Klingtite Red Transmission Belts.

Of their typical performance in the extremely severe Crushing drive duty, Mr. C. P. Kolthoff, Engineer of Western Wheeled Scraper Co., writes:

"Due to the double bends and size of pulleys, this is a severe service for a belt, but your belt has stood up entirely satisfactory and I can see no reason why it should not continue to do so."

Goodyear COMPASS Cord (Endless) Belt is a thoroughly-tested recent Goodyear belting development for hard transmission duty.

It is the most nearly stretchless belt ever built. Endless cords laid side by side carry the drive tensions. A tough fabric envelope completely covers the cords and protects them from pulley and idler abrasions.

Goodyear Klingtite Red Transmission Belting has been known for years in farm and machine shop and mill service for its powerful clinging friction, weatherproof qualities, and long wearing ability.

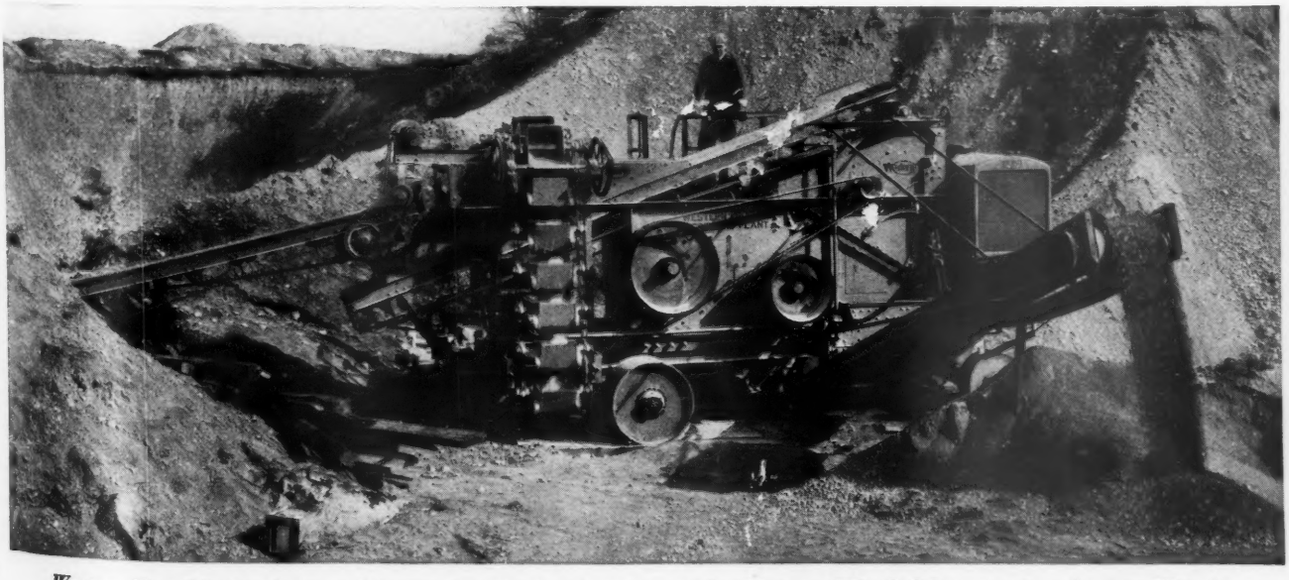
Let the G. T. M. specify the latest and best belting for your power equipment. He can save you money. A line to Goodyear, Akron, Ohio, or Los Angeles, California, or your nearest Goodyear Mechanical Rubber Goods Distributor, will bring him.

THE GREATEST NAME IN RUBBER

GOODYEAR

TRANSMISSION BELTING

TUNE IN: Goodyear invites you to hear the Revelers Quartet, Goodyear Concert-Dance Orchestra and a feature guest artist every Wednesday night, over N. B. C. Red Network, WEAF and Associated Stations



Western Portable Crushing and Screening Plant, manufactured by Western Wheeled Scraper Co., Aurora, Illinois, and equipped with Goodyear COMPASS *Cord (Endless) and Goodyear Klingtite Red Transmission Belts*

Classified Buyer's Guide

A Directory of PIT AND QUARRY Advertisers Arranged According to Product

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified, if brought to the attention of the Advertisers' Service Department.

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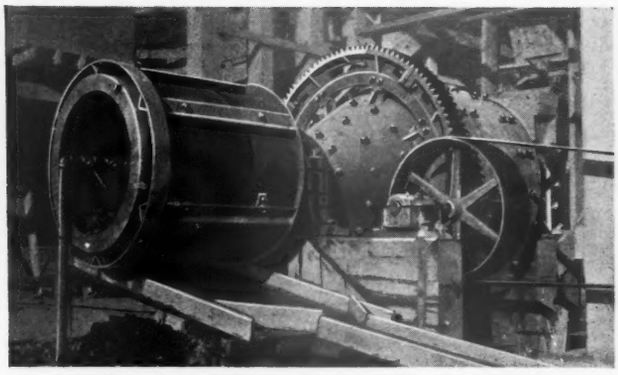
Lewistown Foundry & Machinery Co.
Nordberg Mfg. Co.
Smith Engineering Works
Traylor Eng. & Mfg. Co.

Crushers (Roll)
McLanahan and Stone Corp.

You can't beat this scrubbing action. The heavy material mass in the Hardinge Scrubber does the same thing.



Hardinge Conical Scrubber.

How to Remove Hard Clay Particles From Sand–Gravel–Stone

The Hardinge Scrubber disintegrates tough clay balls, hard clay particles and silt in Sand, Gravel and Stone, so that specifications can be met with ease.

This is a broad claim, but is based on fact.

The method of scrubbing is similar to that of taking your Sand, Gravel and Stone in one hand and rubbing the mass with the palm of the other hand, while both are submerged in water. Simple but effective. This scrubbing and washing action occurs within the material being scrubbed, not on the wearing parts of the machine.

There are no internal moving parts, no submerged bearings, or packing glands to maintain. Operating costs for the ordinary job are way below those of other methods, and operating costs for the tough job are still lower than anything you have encountered before.

Write us for information

Hardinge Company, *Inc.*, York, Pa.

New York—122 East 42nd Street
Chicago—205 West Wacker Drive
San Francisco—235 Montgomery St.

Hardinge

Conical Ball, Pebble and Rod Mills, Ruggles-Coles Dryers, Feeders, Rotary Conveyors, Stone Screens, Thickeners, Clarifiers.

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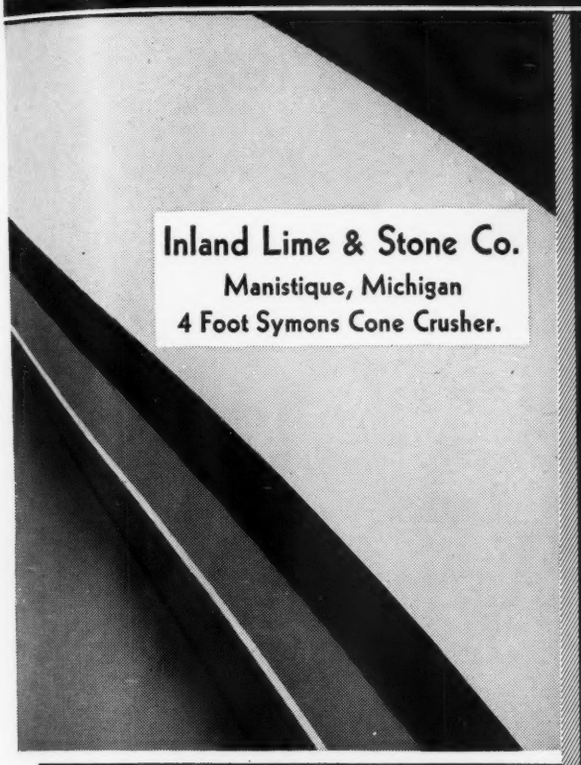
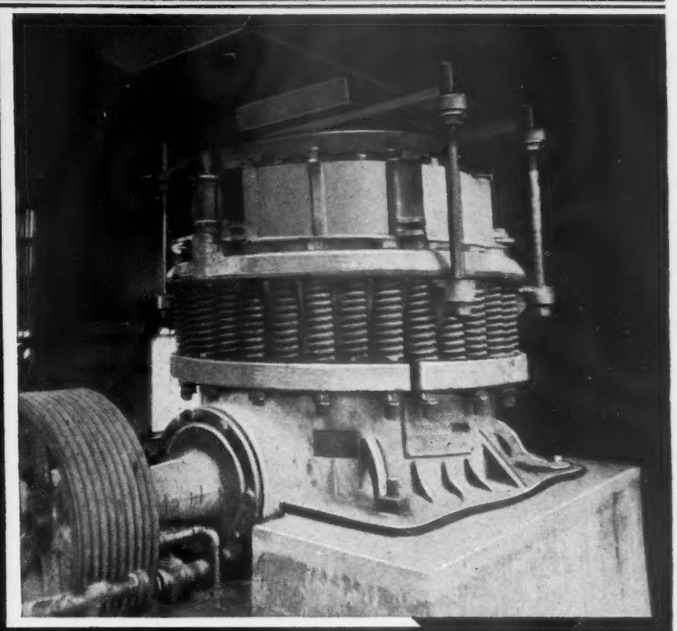
SYMONS CONE CRUSHERS



Inland Lime & Stone Co.
Manistique, Michigan
4 Foot Symons Cone Crusher.



MORE TONNAGE
FINER CRUSHING
LOWER COST

To every producer of crushed materials, the cost of crushing is a vital factor. A low crushing cost is advantageous in many ways and in these days of close competition should not be overlooked.

Symons Cone Crushers with their enormous capacity are noted for their low crushing costs and particularly so were fine crushing is done.

There are reasons for the widespread popularity of the Symons «Cone». Every user is a booster.

Reasons for the Superiority of

Symons Cone Crushers

- Rapid gyration and wide travel of Cone.
- Big diameter of Cone with great crushing area.
- No bearing or spider to obstruct incoming material.
- Major castings are of steel.
- Bronze bearings throughout.
- Positive force feed lubrication.
- Size of product can be changed while in operation.
- Manganese steel crushing members regularly furnished.

NORDBERG MFG. CO.

MILWAUKEE, WISCONSIN

NEW YORK CITY 51 East 42nd St. | LONDON, W. C. 2 BUSH HOUSE | LOS ANGELES, CALIF. 1462 Stanley Ave.

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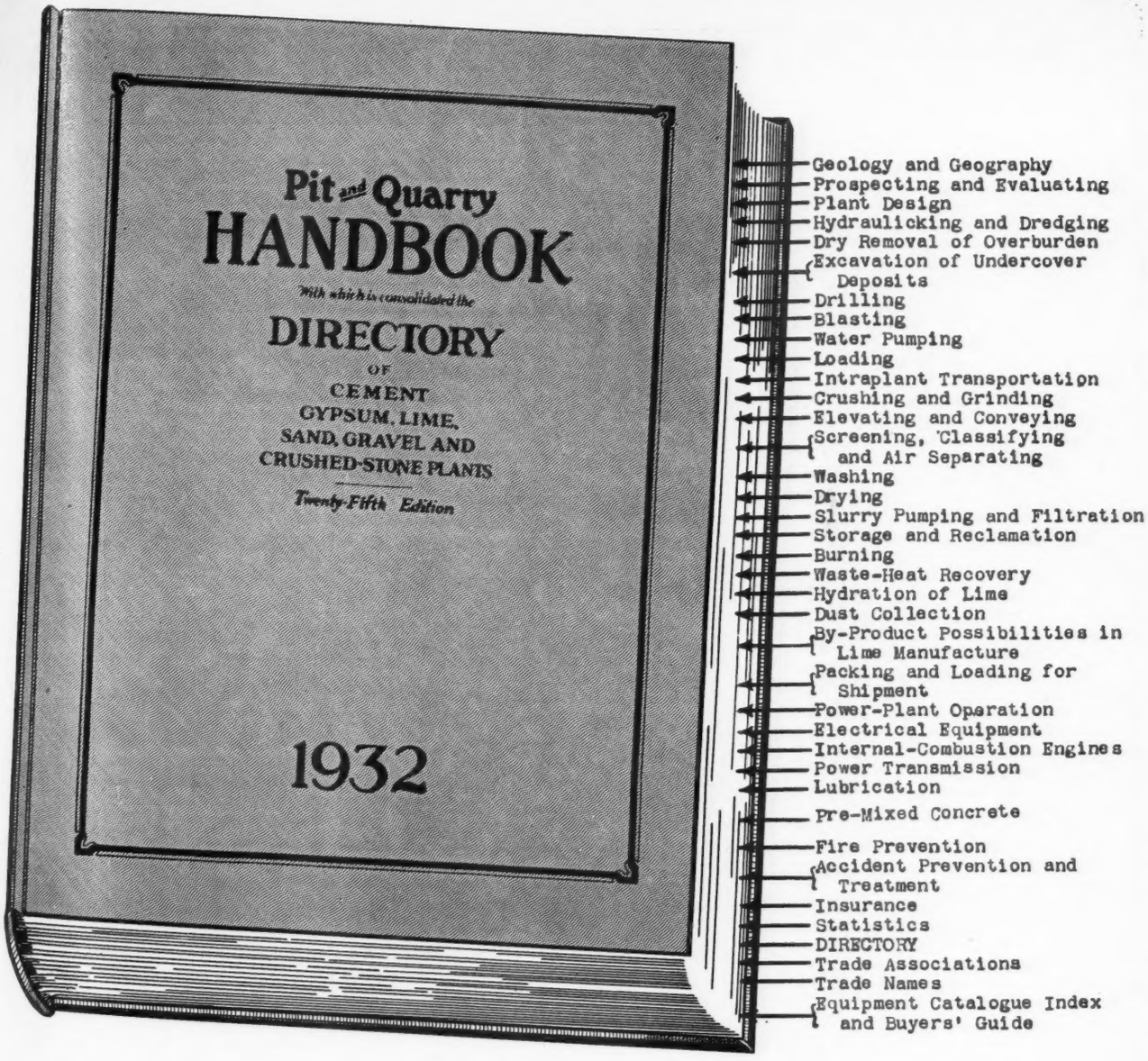
Roebling's Sons Co., John A.

Worm Gears (See Gears and Pinions)



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HYDRO SEAL

VOLUME 24 NUMBER 7

Pit and Quarry

With which is consolidated

CEMENT-MILL & QUARRY

CHICAGO, JUNE 29, 1932

High-Alumina Cement Plant Being Erected

FIRST UNIT NOW COMPLETED

The initial unit of a plant to manufacture high-alumina cement has been completed at San Pedro, Calif. The operating company, organized as the American Aluminous Cement Co., is said to be a subsidiary of the Agricultural Potassium Phosphate Co., of which A. L. Kreiss is president. The project, when all the units are completed, will represent an investment of $500,000, it is reported.

Limestone and shale are to be obtained locally, while bauxite, which provides the aluminous content, will be imported from Adriatic seaports, officials of the new company have declared. The first bauxite shipment of 600 tons has already been landed by the Libera liner *Cellina*. When in full operation, approximately 7,000 tons of bauxite will be imported, it is said. Officials declared that available deposits of the ore in this country are under the control of aluminum producers and, until lower costs are in sight, it will be more economical to import the ore.

Pierre Zucco, cement engineer of San Francisco, will have charge of production, Arthur A. Webber, Santa Monica attorney, is secretary and general counsel for the company.

While reports indicate that actual production is about to start, it is believed that the operation is an experiment, more or less.

Manitowoc Has Shipping Orders for 452,000 Bbl.

Shipping orders for 452,000 bbl. of cement on its Wisconsin state-highway commission contract have been given the Manitowoc Portland Cement Co. of Manitowoc, Wis.

This is over 90 per cent. of the 500,000 bbl. allotted the Manitowoc company under the settlement of the Wisconsin price controversy following the sweeping reductions in prices resulting from the Illinois cement awards.

The Manitowoc company is furnishing bulk cement to the state at 90 c. a bbl. The Alpha Portland Cement Co., which sold 1,500,000 bbl. to the state of Illinois at 65 c., is furnishing 62,500 bbl. to Wisconsin at the same price. The Marquette Cement Manufacturing Co. is supplying 500,000 bbl. to Wisconsin at 70 c.

Huge Firm Organized to Build Highways Abroad

A gigantic road-building corporation, to undertake the construction of highways by scientific methods abroad, has been announced in the formation of the McDonald International Corp. William P. McDonald heads the organization while Charles M. Upham, engineer-director of the American Road Builders' Assn., has been named consulting engineer.

The corporation will seek highway and other contracts in all parts of the world through the introduction of American engineering practice in their design and construction.

Construction Completed at Wyoming Silica Plant

Construction of the new plant of the Silica Products Co., at Clayspur, near Newcastle, Wyo., has been completed and the operation is scheduled to go into production about July 1. The old plant was totally destroyed by fire last December.

All buildings are of steel construction and new steel storage bins will have a capacity of 1,600 tons.

The Clayspur bentonite deposits cover an area of 1,300 acres and provide the plant with ample raw materials.

Consider Utilization of Glass Sand at Syracuse

Syracuse, N. Y., business men are considering the recommendation of the city's chamber of commerce technical committee that a glass-manufacturing plant be established, utilizing glass-sand deposits on Oneida Lake, in view of the fact that natural gas will soon become available there from Pennsylvania and New York fields.

If the suggestion is acted upon, it would mean the revival of an industry now extinct in central New York.

Law Limiting Weight of Trucks Is Upheld

INDIANA COURT MAKES RULING

Constitutionality of the Indiana law limiting the weight and size of motor trucks using state highways has been upheld by Judge Russell J. Ryan in superior court at Indianapolis.

He informed attorneys for the Central Transfer & Storage Co. plaintiffs in a suit attacking the validity of the law, that he was denying the petition for a permanent injunction and dissolving the restraining order.

The law was passed by the 1931 legislature and fixed limits on the weight, length, width and height of motor trucks operating in state highways. The date of going into effect was fixed as January 1, this year, in order that truck operators would have sufficient time to make any changes necessary in their equipment.

Enforcement of the law was vested in the state highway commission. A few days before it was to have gone into effect, however, the suit attacking the constitutionality of the law was filed. The restraining order was issued then and the case has been pending since.

Los Angeles Price War Forces Plant to Close

A price war in the Los Angeles area, which is reported to have forced prices of crushed-stone, sand and gravel down to as low as 35 c. per ton, has closed the plant and quarry of the City Rock Co. at Roscoe, Cal.

The plant will remain closed until prices are again adjusted to a profitable level, Edward Johnson, owner, is reported to have declared.

Maker of Concrete Pipe Buys Minneapolis Plant

The North Star Concrete Co., of Mankato, Minn., has purchased the plant of the Bland Engineering Co., in Minneapolis, Minn., and will soon begin the manufacture of reinforced concrete pipe there. The firm will also continue the operation of its plant at Mankato.

Texas Leads States in Raid on Gas Tax

N. S. & G. ASSN. MAKES SURVEY

Of a total of $537,589,717 collected by the various states in gasoline taxes last year, the traceable diversion for other than highway purposes amounted to $19,442,737, according to a survey just completed by the National Sand & Gravel Assn. The actual diversion, however, is reliably estimated at $40,000,000, the survey discloses.

This year, the total diversion is certain to show a substantial increase over 1931, as many states and the Federal government, as well, by establishing a 1 c. tax to assist in balancing the budget, are dipping more deeply into gasoline-tax funds than ever before.

Texas appears to be the leader in the raid on funds that should be used for road-building. It has already usurped $7,628,630 for the free school fund. Other important diversions so far recorded are: Florida, $3,000,520; Georgia, $2,218,216; Oklahoma, $1,928,570; Louisiana, $1,879,556; New York, $1,526,958. Smaller amounts have also been appropriated by other state legislatures for emergency unemployment relief and for educational purposes.

The association points out that producers must fight the proposed diversions as they come up in the various states. They may not succeed in eliminating diversion entirely but vigorous opposition should be reflected in less drastic encroachments on road-building funds.

Building Permits Show Decline of 19% in May

Building permits in 577 cities and towns of the United States during the month of May, 1932, amounted to $42,994,477, according to official reports made to S. W. Straus & Co. This figure represents a 19.3-per cent. decline from April, 1932, when the volume for these cities was $53,268,724, as compared with a normal seasonal expected decline of 11.8 per cent. Permits issued during May, 1932, fell 69 6 per cent. below the same month of 1931.

The table at the bottom of the page gives a detailed tabulation of the value of May permits in the various states.

Washington Cement-Mill Official, Aged 66, Dead

Joseph H. Neill, 66 years old, a plant official at the Irwin, Wash., mill of the Spokane Portland Cement Co. (until recently the International Portland Cement Co., Ltd.), died June 6 at his home in Spokane of a heart attack. He had been connected with the plant at Irwin since 1912 and was a brother of R. K. Neill, president of the company, and an uncle of F. D. Neill, superintendent. Before becoming connected with the Spokane organization, he was for many years associated with the Finch & Campbell mining enterprises in Idaho.

Dakota Quartzite Plans to Erect 700-Ton Plant

Formation of the Dakota Quartzite Co. to succeed the old Dakota Granite Co. has been effected at Sioux Falls, S. D. The new concern is capitalized at $25,000. H. J. Gallagher is president and E. R. Gallagher secretary.

According to President Gallagher, a complete new 700-ton plant will be erected. Meanwhile, a large stock of crushed stone which was taken over from the old company will be used in filling orders.

Tennessee Plant Starts Producing Mineral Wool

Mineral wool for insulation purposes is being manufactured at the new plant of the Tennessee Products Corp., of Nashville, Tenn. The operation is located at Rockdale, Tenn., and present production approximates 30 carloads per month and this output will be increased as improvement becomes apparent in the building industry.

The raw material, which comes from the Rockdale quarries, is composed principally of silica, calcium, alumina and magnesia. Coke is employed to fuse the material for spinning. The material is being marketed under the trade name of "Tensulite" and in its loose form weighs approximately 6½ lb. per cubic foot.

The company has established sales offices in New York, New Orleans, Birmingham, Memphis, Chattanooga, and Cincinnati. Principal use of the material is for insulating walls, ceilings and floors in homes.

Gravel Company Asks Payment for Materials

A suit to collect $1,500 for gravel supplied the township has been instituted by the Delaware Sand & Gravel Co. of Muncie, Ind. According to the plaintiff the material was ordered and delivered during the term of George Hawkins, former trustee, who is now serving a term in the Indiana state prison at Michigan City for embezzling township funds.

Atlas Rock Co. Installs New Vibrating Screens

Revolving screens at the Oakdale, Cal., plant of the Atlas Rock Co., are being replaced with those of the vibrating type, according to R. L. Robinson of the Atlas-Olympia Co., Ltd., of San Francisco, parent concern.

The company's business is showing some improvement, Mr. Robinson reports.

Milwaukee Firm Given Contract to Supply Sand

The Sand Products Corp. of Milwaukee, Wis., has obtained a contract to supply more than 500,000 tons of sand to be used in a huge fill in connection with the new Milwaukee har-

BUILDING PERMITS BY STATES AS ISSUED IN 577 CITIES IN MAY, 1932, AN DCOMPARISONS WITH MAY, 1931, AND APRIL, 1932

State	May, 1932	May, 1931	Apr., 1932	State	May, 1932	May, 1931	Apr., 1932
Alabama	$ 175,055	$ 447,522	$ 935,766	Nebraska	$ 198,006	$ 464,915	$ 355,538
Arizona	85,593	243,642	123,027	Nevada	84,850	165,810	78,950
Arkansas	38,618	88,722	28,816	New Hampshire	41,253	97,633	40,842
California	4,999,253	12,771,858	5,937,769	New Jersey	1,410,051	3,754,798	1,996,093
Colorado	542,137	1,029,410	472,612	New Mexico	38,007	113,257	47,376
Connecticut	1,058,697	3,001,789	1,023,628	New York	8,121,566	47,218,873	12,322,339
Delaware	91,233	370,931	64,174	North Carolina	355,089	815,585	149,149
District of Columbia	946,135	4,933,579	1,085,145	North Dakota	93,969	151,304	51,780
Florida	832,382	1,333,516	795,796	Ohio	1,997,095	12,949,471	2,236,744
Georgia	167,361	489,674	215,945	Oklahoma	207,994	1,967,278	308,726
Idaho	70,343	87,464	45,447	Oregon	509,508	560,878	507,725
Illinois	1,166,216	3,964,940	1,663,860	Pennsylvania	4,334,552	6,413,332	5,501,072
Indiana	1,051,837	1,440,030	540,947	Rhode Island	520,760	753,655	377,938
Iowa	1,167,122	1,102,544	469,053	South Carolina	137,609	205,520	130,682
Kansas	158,507	413,277	138,658	South Dakota	63,040	249,647	150,730
Kentucky	176,983	398,157	149,283	Tennessee	487,643	750,284	396,490
Louisiana	180,538	385,514	460,202	Texas	1,188,188	5,134,808	3,047,710
Maine	95,773	75,262	55,918	Utah	91,635	443,426	94,882
Maryland	2,110,873	3,415,555	1,537,030	Vermont	35,000	83,000	None
Massachusetts	2,163,809	6,769,047	2,536,588	Virginia	359,727	731,044	390,219
Michigan	1,582,852	4,817,765	2,493,728	Washington	723,742	1,991,350	525,403
Minnesota	1,420,476	3,616,585	1,346,572	West Virginia	161,864	250,684	275,249
Mississippi	30,013	65,365	47,435	Wisconsin	868,518	2,614,979	1,070,542
Missouri	605,725	2,201,353	997,824	Wyoming	22,790	41,690	17,652
Montana	24,490	120,720	29,670	Totals	$42,994,477	$141,507,442	$53,268,724

bor improvements. Sand is being obtained from Lake Michigan by the company's suction dredge *W. E. Fitzgerald.* More than 60 loads will be required to complete the contract.

Trap Rock Producer Is Installing New Crusher

The Florida Trap Rock Products Co., Zephyrhills, Fla., of which A. M. Wilson is manager, is putting in concrete foundations for machinery in its new crushing plant near the Hillsborough River, at Crystal Springs. The company will install an additional crusher and soon begin operations.

Fire Razes Compressor House at Niesen Quarry

A fire, which occurred on Memorial Day, destroyed the compressor house in the quarry of the Kaukauna Quarry Co., at Kaukauna, Wis. Besides the building, the loss included a large Sullivan air-compressor, air tanks, pumps, tools, etc.

New equipment was immediately ordered, according to M. H. Niesen, president, and operations were to have been resumed about June 15.

Bones of Mastodon Are Found in Michigan Pit

A marl bed recently opened near Colon, Mich., has yielded the bones of what is believed to be a prehistoric monster. The find was made when an excavator, operated by Ben Frank, struck a large object which proved to be a jawbone fragment three feet long. Several huge teeth and ribs were also found.

It is hoped that further digging will reveal the remaining parts of the skeleton.

Cement Output Higher in U. S. S. R. This Year

In the first quarter of the year the output of cement in the U. S. S. R. totaled 791,000 metric tons, an increase of 49 per cent. over the 530,000 tons produced during the same period of 1931, according to *Economic Review of the Soviet Union.* The gain was due to extensive construction work recently completed. In 1931 production totaled 3,332,000 tons, as compared with 3,115,000 in 1930 and 1,906,000 tons in 1913.

Utica Hydraulic Cement Plant Recalls Workmen

Sixty employees have returned to work at the plant of the Utica Hydraulic Cement Co. at Utica, Ill.

The plant had been closed for several months.

Erecting Rotary-Kiln Lime-Recovery Plant

THE Bogalusa Paper Co., of Bogalusa, La., is erecting a rotary kiln plant for the recovery of lime used in the causticizing operation at the firm's pulp and paper mill at Bogalusa. The above photograph was taken last month and shows the two 110-ft. kilns in place. Each kiln is 7½ ft. in diameter.

Lime sludge is first washed over rotary filters after which, in the form of a thick slurry, it is passed to the kilns where it is burned. The reburned lime is then dissolved and reused in the causticizing operation, according to T. T. Dunn, a member of the Bogalusa company's engineering department.

Builds Gravel Plant to Provide Road Material

Roy L. Houck of Port Orford, Ore., is erecting a sand-and-gravel plant on Brush Creek, south of Port Orford, and expects to begin production shortly. Mr. Houck has obtained a contract to furnish $50,000 worth of aggregates to be used in constructing a section of the Pacific Coast Highway passing through Oregon.

Florida Producer Ships 18,000 Tons to Road Job

Connell & Shultz, Williston, Fla., are overhauling the machinery at their quarry, in preparation for shipping 18,000 tons of crushed stone to Seminole, Fla., for state road construction.

Joseph S. Young Made President of Lehigh Co.

A son of the founder, the late Col. E. M. Young, has been elected president of the Lehigh Portland Cement Co. He is Joseph S. Young and, in being elevated to the presidency, Mr. Young achieves the honor of being the youngest chief executive among the large Portland-cement producers in this country. He is 34 years old. For the past six years he has been vice-president of the company and was a direct assistant to his father.

In the selection of Mr. Young, the board of directors have chosen a man well fitted to serve as head of the company. For nine years he has been connected with the Lehigh company and for many years was an official of the Great Lakes Portland Cement Co.

Ranchers Organized to Prosecute Cement Firm

Ranchers in Clayton Valley, in Contra Costa County, Cal., within a radius of several miles of the plant of the Cowell Portland Cement Co., have formed an association to prosecute the cement company as a private nuisance.

A suit against the company was filed some time ago by county officials, following numerous complaints that dust from the Cowell mill was ruining crops and grazing lands in the vicinity. The cement company retaliated by closing its plant and quarry and no work has been done since.

Flying Rock from Blast Causes Worker's Death

Chester Adams, 51 years old, was fatally injured on June 15 when he was struck by a flying rock as a blast was detonated in the Callis & Hughes crushed-stone quarry near Madison, Ind. Mr. Adams was observing the shot at what he thought was a safe distance, witnesses said, when the stone hit him in the head, crushing his skull.

The blast was set off to provide a quantity of material to be crushed and sized for state-highway paving in Kentucky.

Editorial

Tell It to Your Banker

THERE is a general tendency to credit the banker with an unduly large share of the responsibility for business conditions and, at the same time, with an unduly large share of knowledge concerning the causes of and remedies for business difficulties. In the eyes of too many business men the banker is almost omniscient as well as omnipotent, so that the exercise of his power in the light of his knowledge makes him at once a popular scapegoat and an unpopular citizen. The average man is capable of the deepest antipathy toward the one who will not lend him money. The banker, according to the popular view, commits no sin so grave as refusing to lend.

Strange as it may seem, in view of bank failures and the collapse of all kinds of securities, bankers do have a policy in lending money and they attempt to follow it. This policy may not exhibit any fine regard for public interest, since it was not contrived to promote public interest, nor may it show remarkable tenderness for the borrower, since it was not devised to please the borrower. It appears to work admirably for the banking profession, and, as that is its purpose, neither the public generally nor the enormous class of real and would-be borrowers who fail to approve its results should be astonished. It works as it was planned to work, and no more should be expected of it.

Of course, this does not mean that the policy of lending money as followed by banking institutions large and small is above criticism or that borrowers have no right to scrutinize it or to point out its bad points so far as these are discoverable. That is what thousands of borrowers—especially would-be borrowers—are doing, but as they are not bankers and do not understand banking, they are to be pardoned if their criticisms are sometimes harsh and often unjust. The banker, like all other exponents and beneficiaries of the privileges of big business, has come in for a great amount of criticism—we might truthfully say abuse—for the simple reason that he has not lifted business out of the doldrums and placed the country on the pinnacle of prosperity.

Perhaps the best way to understand banking is to ask a banker to explain it; at least this method has the advantage of discovering what the banker thinks it proper for one—let us say a borrower—to know. The first thing one will learn is that bankers do not lend their own money, that they lend their depositors' money and that, in doing so, they are between the devil and the deep sea. The borrower wants to borrow all he can on whatever security he has, while the depositor wants to feel certain that his money on deposit will be there when he needs it. Reconciling these antithetical points of view is the painful and sometimes unprofitable task of the banker.

Most business men in need of money have discovered in recent years that, although the country has been in the depths of what is called a depression, there has been no shortage of money. There has, however, been a dire shortage of collateral, and that is what the banker looks at. He is concerned only in the interest return on the money he lends and in the likelihood of repayment of the loan at maturity. He is much more interested in the latter than in the former, hence his insistence on good collateral and what he calls "self-liquidating" loans. But what, asks the would-be borrower, is a "self-liquidating" loan?

If your plant is very efficient and you want to increase its efficiency still further by the installation of a more modern crusher, let us say, your banker refuses to lend you the money with which to buy it. Let us assume that one of your competitors, with a run-down inefficient plant, has received from the county an order for stone which he expects to deliver and receive payment for in 30 days. His present crusher being beyond repair, he wants to borrow to buy a new one, so his banker —perhaps the same banker—lends him the necessary funds—including perhaps some of your money on deposit with him—and your competitor advances a notch in his race with you. He probably got the order because of quoting a below-cost price, but the banker is not interested in the profit in the borrower's stone order or even in the fact whether the borrower is conducting a profitable business or whether he will be in business twelve months later. The borrower will receive from the county enough money to repay the loan and interest, and that satisfies the banker. He has negotiated what the banker calls a "self-liquidating" loan, because the use of the money in the way indicated will make possible repayment as promised. Likewise, a farmer can borrow money to buy cattle if his land is planted with feed crops, because the increment in the value of the cattle through feeding will more than repay the first cost; it is, therefore, a "self-liquidating loan." On the other hand, a nationally-known stomach specialist, whose income in normal times exceeds $50,000 a year, can not borrow $5,000 to maintain his staff because there is no certainty that there will be enough stomach-trouble cases to repay the loan when due; it is not a "self-liquidating" loan.

When it comes to lending his depositors' money, the banker is as careful as he can be or thinks he ought to be. In the lending of money for investment securities that can be turned over quickly to the investing public he is not so particular, nor need he be. He risks nothing at the moment and, by a strange habit of reasoning, he is not held either legally or morally responsible if the securities he has sold should prove to be worthless in time. He will underwrite a bond issue on a plant to whose owners he would not lend a dollar of his depositors' funds, because he can pass on to the bond buyers the

risks of the former while he is legally accountable to his customers for the latter.

The ability of the banks to lend money has been greatly increased by the formation of the Reconstruction Finance Corporation but, unless bankers adopt a different attitude toward would-be borrowers, the funds made available to the banks will not find wide use. The times are unusual and the needs for money are unusual. Therefore, the reasons for which loans are made should be unusual and also the tests by which their soundness is judged. Altered conditions call for altered methods, and the banking system of the country should adapt itself to the demands of the period. The formation of the Reconstruction Finance Corporation is a step in that direction but there must be a similar departure from accepted practice on the part of the local banks themselves. Only through local banking facilities can the Reconstruction Finance funds be put to work, so it is the loan policy of local banks which must be changed.

There are many proper causes for borrowing money which do not provide the "self-liquidating" feature required by bankers, and there are many producers in our industries who deserve help from the banking interests. There is no need for expansion of production facilities in our industries and pleas for loans for such a purpose should be refused. There is, however, great need for the improvement of those facilities, for the purchase of equipment that will reduce the cost of production and, so, better fit the producer to meet the competition of to-morrow. Bankers should provide the necessary funds.

Producers who can justify their borrowing wants on this basis should talk to their bankers frankly about the present situation of overproduction and about the need for placing production on a more economical plane than any the industry has seen. They should tell them about the absolute necessity for protecting the capital invested by established and well-entrenched producers against the ravages of fly-by-night competition, which is often able to borrow money when sound business men can not. There is no higher degree of "self-liquidation" than the specialized knowledge and experience and the cumulative good-will of an established business that has been operated on sound principles and has shown consistent advance in normal times, and there are many bankers who will be receptive to this idea provided it can be supported by facts. Getting a loan is as much a job of selling as getting an order, and the same rules of knowing your problem and presenting a factual demonstration apply.

If bankers do not give industry the help it needs, industry may be forced into the banking business itself. Self-financing may become as common and as important as self-insurance. Through the medium of the banks business men are lending their surplus funds to their competitors without realizing it. Certainly they can do the same thing just as easily and with less expense by operating directly. On account of the willingness with which business men lean on the banks, bankers have lost sight of this latent possibility and have come to look upon themselves as the only means of providing credit. In the crisis of 1921 one of the country's largest department stores lent $5,000,000 to its greatest rival to prevent the latter's collapse when the banks refused to act. It saved not only its competitor, but the face of its industry, and prevented the loss of hundreds of thousands of dollars of business to itself that would inevitably have resulted from publication of the truth about the industry's condition. This incident illustrates the power of business to act independently of the banks and, incidentally, provides a striking example of the modern sense of industrial solidarity and responsibility.

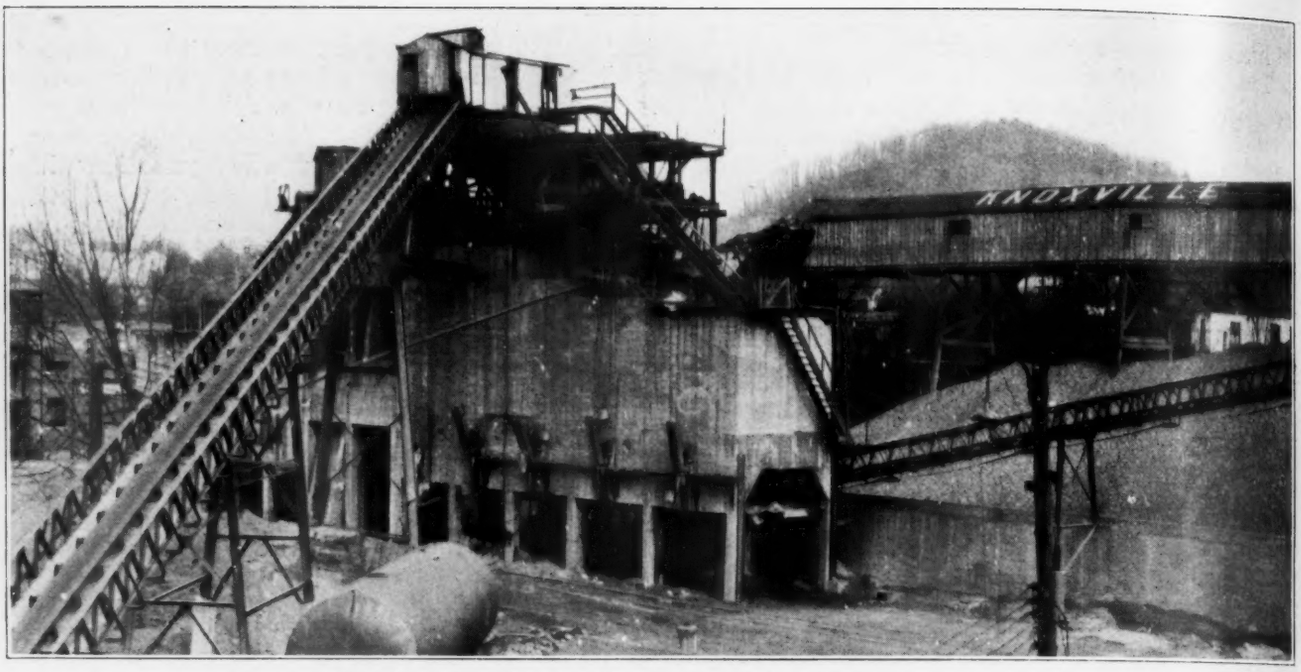
Portuguese Cement Demand Gains

A large proportion of the cement manufactured in Portugal is known as "artificial Portland" and it competes with the best imported cements in quality and price. There was an output of 555,578 bbl. in 1931 compared with 578,886 in the preceding year. Domestic consumption has been estimated at 652,710 bbl. in 1930 and 615,920 in 1931, indicating importation of about 10 per cent. of the total required.

The manufacture of cement commenced in Portugal in 1890, and was followed by decreased imports, particularly since 1919, when the Empreza de Cimentos de Leiria was founded. Three other companies are now engaged in cement manufacture, one small and the other two of only medium size, with their actual output less than half their capacity. The Empreza de Cimentos at Lisbon, the principal factor in the business, has a capacity of 700,000 bbl. a year but its production averages only 470,000 bbl.

Imports of 100,421 bbl. of cement in 1930 were considerably larger than in any recent year and compared with 81,742 bbl. imported in 1929 and 87,886 in 1928. In 1930 the largest contribution was that of 49,062 bbl. from Germany, followed by 25,715 from Denmark. Practically all the remainder came from other European countries. The United States has made trifling contributions to this market in the last three years. Belgium and England were the important sources before 1928.

Exports of Portuguese cement reached their peak with 13,256 bbl. in 1925 and were recorded at 2,287 bbl. in 1929 and 1,993 in 1930. All these shipments go to the Portuguese colonies, as do reëxports, which amounted to 23,956 bbl. in 1929 and 46,781 in 1930. The increase of reëxports in recent years is due to Portuguese protective shipping laws, which force cargo for the Portuguese colonies to be transshipped in Portuguese bottoms. A rebate of 8 per cent. in customs duty is allowed on merchandise transshipped from a foreign vessel to a Portuguese vessel in London, Amsterdam, Rotterdam, Antwerp, Hamburg, Havre, Bordeaux, Marseille, Genoa, and Bremen. The duty on cement is equivalent to 21½ c. per hundredweight.



The Knoxville plant viewed from the new barge-unloading crane.

Confident in Return of Prosperity, This Producer Expands Operations

Knoxville Sangravl Material Co. Improves Property; Adds Batching, Loading Plants

ONE of the most successful of our southern river-aggregates producers expressed faith in the future of its market through the completion of numerous plant improvements during the past 2-year period of business retrogression. Some of the improvements were major in character. These include the replacement of a number of former wooden conveyor carriages with steel structures, the installation of a new stationary barge-unloading whirley crane, and complete mixed-in-transit batching and truck-loading plants.

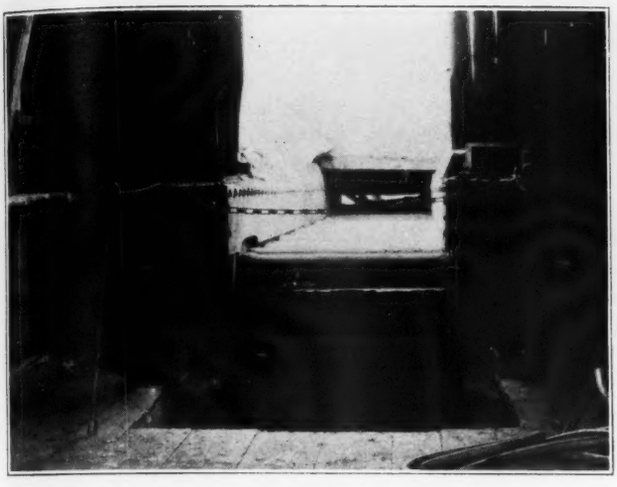
Organized in 1916, the Knoxville Sangravl Material Co. has enjoyed a steady growth, until it is now the largest producer in the Knoxville, Tenn., district. Three dredges are in service as parts of a river fleet consisting of 11 barges and 2 large towboats. The company's plant is favorably situated and is adequately equipped with high-capacity production facilities, supported by a finished-material stock-pile of 40,000 tons. Geo. J. Oehler is president and treasurer of the company and H. A. Orr is superintendent.

New whirley crane which unloads dredged material from barges direct to the primary crusher or to raw-material stock-piles.

Stock-piles feed to a tunnel for recovery, the elevator at right taking the material to the batching plant.

Gravel is won from Tennessee River by a dipper dredge, *No. 4*, and a bucket dredge, *No. 3*. Sand is

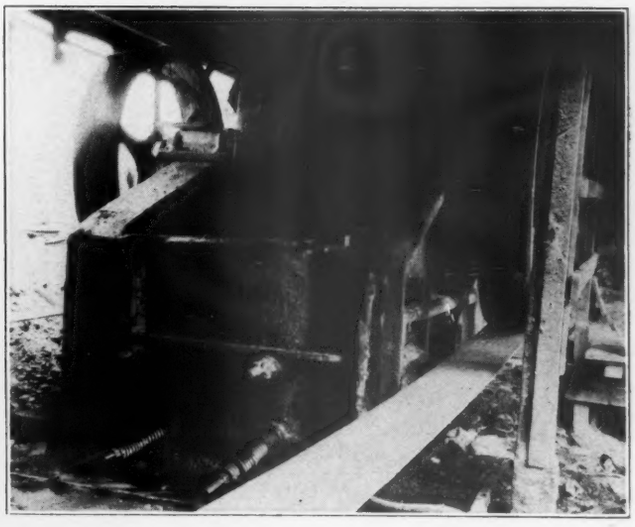
obtained by dredge *No. 5* which is of the clam-shell type. *No. 4*, the dipper dredge, has a 32-ft. by 80-ft. hull and is equipped with a 1½-cu.yd. dipper, powered by Marion steam machinery. *No. 3*, the bucket dredge, has a 30-ft. by 75-ft. hull and is equipped with Clyde Iron Works hoisting engines for the manipulation of a Blaw-Knox 2-cu.yd. clam-



Roll-grizzly which receives raw material from the crane.

shell bucket. *No. 5*, the sand dredge, carries a ¾-cu.yd. clam-shell bucket with a compact screening outfit aboard. The latter includes a 42-in. by 8-ft. jacketed rotary screen.

Digging operations are carried on in both Tennessee and French Broad Rivers at a distance of twelve or more mi. south of the Knoxville, depending on river conditions. For the transportation of the materials to the plant, three steel barges, carrying 300 tons each, were recently added to the company's fleet. There are also three wooden barges carrying 200 tons each and five wooden barges of 50-ton capacity. The river crafts *Adeline* and *Geo. Oehler*, both steam-operated stern-wheelers, are representative of the type generally employed in this class of service. The *Geo. Oehler* is of modern construction, having been placed in service in 1928. It has a wood gunnel hull, 28 ft. by 134 ft. in size,

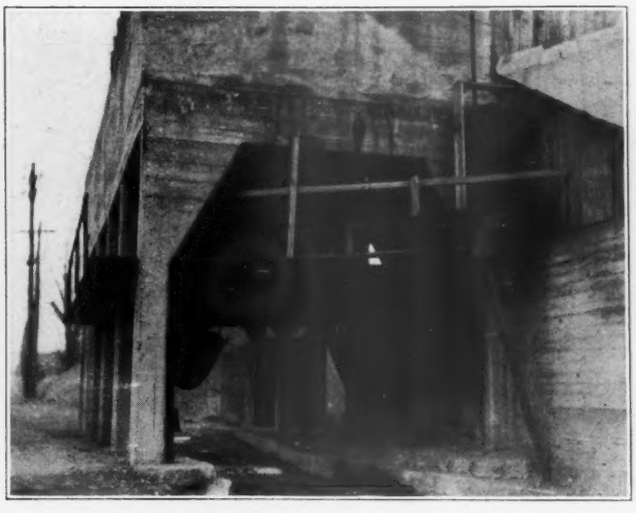


The primary jaw crusher and belt drive.

42 in. deep. The vessel carries three 38-in. by 24-ft. boilers which supply steam at 245 lb. pressure to a pair of Hegewald 14-in. by 5½-ft. engines. The vessel is driven by a 16-ft. by 18-ft. stern wheel and has a 25-in. draft.

Through the new American Hoist & Derrick Co. whirley crane, barges at the company's are quickly unloaded either to ground storage-piles back of the dock or direct to a traveling grizzly which feeds a Buchanan 24-in. by 48-in. jaw crusher. This crane, which operates at a height of 55 ft. above the water level, is mounted on a steel tower and has a 60-ft. operating radius. It has a 100-hp. electric-motor-driven hoist for the manipulation of a Williams 2½-cu.yd. clam-shell bucket. Raw materials can be stored in quantities up to 75,000 tons along the river front. Material for the plant is discharged by the crane to a 36-in. roll-grizzly which is 36 in. wide and 12 ft. long between centers. The rolls, being spaced 3 in. apart, allow minus-3-in. material to fall through to a 30-in. inclined belt-conveyor leading to the main plant conveyor. The oversize gravel is carried by the grizzly to the hopper of the Buchanan crusher. A 26-in. belt-bucket elevator delivers the crushed gravel to the main conveyor.

Cement store-room, with elevator and cement-batching apparatus.

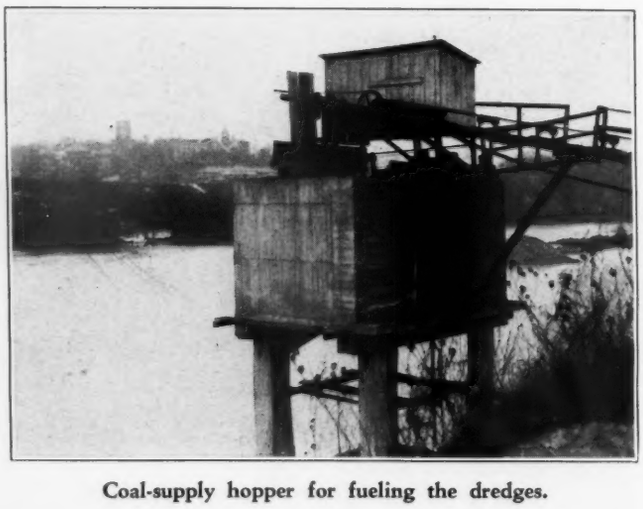


Dry-batching equipment beneath the truck-loading bins.

The No. 3 dredge employs a 2-cu.yd. clam-shell bucket.

After passing the primary-crushing plant, the material is handled by the first of the newly reconstructed conveyors. This unit carries a 26-in. belt 254 ft. long between centers and is of Stephens-Adamson make. The Stephens-Adamson Mfg. Co. designed the original plant, furnishing much of its equipment. The carriage, which is constructed of standard structural-iron shapes, is fabricated at the plant.

Crushed oversize gravel and the grizzly "throughs" are delivered by the new long inclined conveyor to a 6-ft. by 12-ft. Gilbert screen, which is equipped with 2⅜-in. perforated plate screens and a 1¼-in. manganese-steel wire-cloth jacket. Rejected gravel from this screen is sent to a Weston No. 36 B gyratory crusher where it is reduced to minus 2-in. material. It is returned in closed-circuit to the Gilbert screen by a 26-in. belt-bucket elevator. The Weston crusher is direct-driven by a 50-hp. Ideal vertical motor. From the Gilbert screen the gravel is divided and sent to two other Gilbert screens for final washing and classifying. All three units are driven by a single 40-hp. motor through a jackshaft with chain drives. The two latter screens are 5 ft. by 9 ft. in size and are fitted with 1¼-in. perforated-plate screens with 5/16-in. jackets. Material passing these jackets is sent to a 4-ft. by 5-ft. screen for the production of 3/16-in. pea gravel. A good demand exists for this grade of gravel for coating oiled roads and streets. Sand and water passing the 3/16-in. screen are flumed to a large drag-tank for the production of concrete sand. The tank has a 15-ft. horizontal section followed by a 12-ft. incline and is equipped with a 42-in. drag-chain, the paddles of which are mounted on 10-in. centers.



Coal-supply hopper for fueling the dredges.

All finished materials, which include two grades of gravel and two of sand, are stored for loading in a concrete bin structure which is sufficiently large to hold 8 car-loads. Trucks are loaded directly through a passageway between the supporting columns, while cars are loaded from an adjoining track. All processing equipment, including the Gilbert screens, Weston crusher and the drag-tank are located in the tipple above. On the side of the loading bin opposite that used for car loading, a 200-ft. receiving conveyor is located for the purpose of relieving the bins of excess material and delivering them to a gallery conveyor system for distribution to the company's extensive yard stock-piles. In the series are the receiving conveyor, already noted, which inclines to a 32-ft. cross conveyor, and a 156-ft. shuttle-type conveyor which is located on a 300-ft. timber gallery. All conveyors in the system have Manhattan 24-in. belts. Beneath the conveyor gallery sufficient space is available for the storage of 40,000 cu. yd. of aggregates.

The receiving conveyor sends material from tipple to the yard stock-pile gallery conveyor.

Stocked materials are recovered from the ground-storage system through a 300-ft. conveyor tunnel. Built of reinforced concrete, the tunnel has a rectangular cross-section with a flat-top ceiling. Bin gates for loading the conveyor are installed on 10-ft. centers. The conveyor is equipped with a 24-in. belt which discharges direct to the boot of a 76-ft. elevator. This unit sends the materials to a steel tank over the batching plant or to a pair of 20-in. conveyors leading to the truck- and car-loading bins.

The company's facilities for the production of ready-mixed concrete consist of a complete transit-type batching plant with a bag-cement storeroom.

(*Continued on page 36*)

The Koon Dam as it appeared soon after completion.

Producing Aggregates and Concrete for the Thomas W. Koon Dam

Huge Barrier Impounds Water Supply for City of Cumberland, Md., 12 Miles Distant

THE Vang Construction Co. of Cumberland, Md., and Pittsburgh, Pa., has just completed the Thomas W. Koon Dam for the City of Cumberland, Md. Of interest to the readers of this magazine is the method used in the manufacture of concrete aggregate. The dam is located on Evitts Creek, Bedford County, Pa., 12 mi. from Cumberland, at the head of Lake Gordon, the present water-supply of the city. The new dam will give an additional 2,500,000,000 gal. of storage.

Three classes of concrete make up the 72,000 cu. yd. used in the dam. The main mass of the dam is of 2,500-lb. concrete, using only large aggregate, 3¼-in. to 8-in., and sand. This coarse-aggregate size was determined by the maximum size that could be quickly and economically handled by a 2-cu.yd. mixer. A 2-yd. batch consisted of 750 to 800 lb. of cement, 2,700 to 2,800 lb. of sand, 4,200 lb. of rock and 450 lb. of water, including correction for moisture content. Normally a mix of 2 cu.yd. requires approximately 1,200 lb. of cement. Test cylinders using this amount of cement showed a breaking strength in excess of 5,500 lb. after 28 days. The specifications called for mass concrete in the dam to meet a breaking strength of 2,500 lb. The amount of cement was, therefore, reduced, and when using 900 lb. of cement in a 2-cu.yd. mix they got a breaking strength of 3,500 lb. In using the 750 lb. of cement the breaking strength averaged approximately 2,800 to 3,000 lb. after 28 days. In addition to the aggregate furnished for this concrete, a considerable quantity of road stone was furnished to the Tri-State Engineering & Construction Co. for roads near the dam.

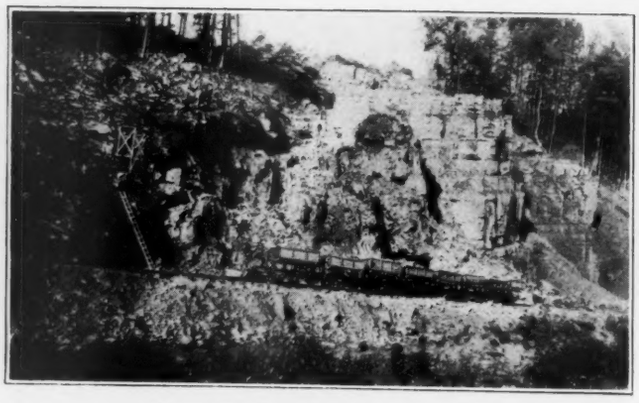
Rock for coarse aggregate and manufactured sand was obtained from a calcareous sandstone (similar to hard trap rock) quarry opened in the creek valley about 3,000 ft. from the dam. Koehring gasoline shovels loaded the rock into 5-cu.yd. narrow-gage Western dump cars which were hauled to the crushing plant by Porter steam dinkies. Tests showed that the best sand graduation was obtained by using approximately 65 per cent. manufactured sand and 35 per cent. natural sand. The latter was furnished by the Fairfax Sand & Crushed Stone Co., Thomas, W. Va. This natural sand and all the cement used on the job were hauled by Sterling motor-trucks a distance of about 12 mi. from the railroad siding at Cumberland, Md. Quarry-run rock was dumped directly into a Buchanan 36-in. by 42-in. jaw crusher, which reduced it to about 8-in. and under. A 30-in. Telsmith belt-conveyor,

Belt-conveyor to main plant.

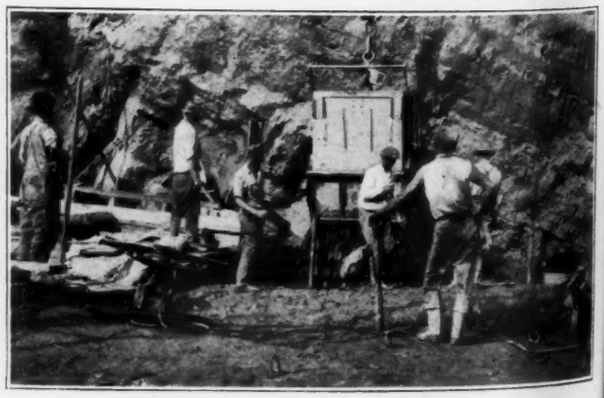
Operator in the scale-house.

The double-deck stone screen.

The crushing-and-screening and concrete-mixing plants.



Shovel loading the side-dump cars.

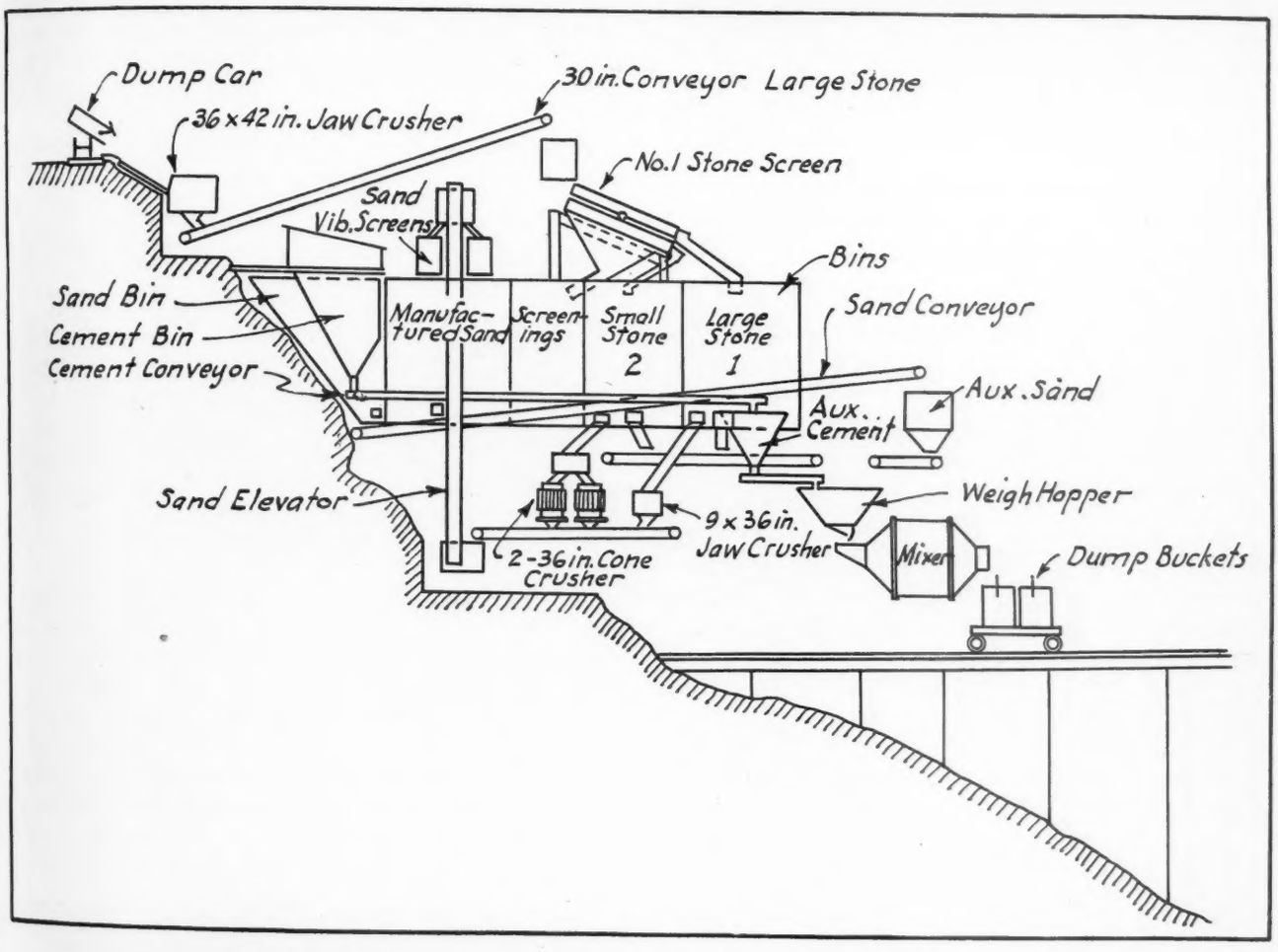


Dumping one of the concrete buckets.

operating on 126-ft. centers, carried the product of the primary crusher to a Telsmith 4-ft. by 10-ft. balanced double-deck vibrating screen. For the mass coarse aggregate, the top-deck openings screened out plus-3-in. material, chuting it directly into the coarse-aggregate storage-bin. The material passing over the 5/8-in. bottom-deck openings was chuted direct into the small-aggregate bin. Material 5/8 in. and under was wasted from this primary crushing operation due to the presence of loam and silt. This waste amounted to about 1 per cent. of the total material passed through the plant.

Chutes from the large- and small-aggregate bins allowed the rock to be fed into a Wheeling-type 9-in. by 36-in. jaw crusher which reduced the stone

Quarry face and floor after a shot.



Drawing showing arrangement of the aggregates and concrete-mixing plants.

Tamping the concrete into the forms with an electric vibrator. Note the extremely coarse, dry mix.

to a smaller size, either for the higher-strength classes of concrete or for feeding the two No. 36 Telsmith cone crushers in which the sand was manufactured. Due to the extremely hard, tough rock encountered it was necessary to use a rather close setting on the cones and a recirculating load. From the cone crushers the sand was carried by a 20-in. Telsmith belt-conveyor operating on 53-ft. centers, to a No. 5 Telsmith continuous-bucket belt-elevator on 54-ft. centers. The discharge from this elevator was split and fed to two Telsmith 3-ft. by 8-ft. balanced double-deck vibrating sand screens. The top deck 1/4-in. openings returned the oversize to the cone crushers by gravity feed. Material passing

Whirley trestle and excavation at base of the dam.

over the bottom deck, ¼-in. to 100-mesh, was chuted direct into the manufactured-sand bins. Material through the 100-mesh was dust and loam and was wasted.

The batch mixing was semi-automatic and was designed to give maximum capacity through the 2-cu.yd. Smith mixer. Stone was fed from the bins to a 30-in. Telsmith conveyor and discharged into a Stephens-Adamson weigh-hopper over the mixer. Sand and cement were fed by separate Stephens-Adamson belt- and screw-conveyors from their respective bins to the weigh-hopper. Push-button controls were located in the scale-house and operated by the weighmaster. A special three-arm Toledo scale, designed especially to meet the rigid concrete specifications on this job, was used. The scale operator controlled all the feeding and weighing operations and one man was detailed to dump the electrically-driven mixer. While the mixer is mixing and dumping a batch, the weigh-hopper is filled and as soon as the tilting mixer rights itself the new batch is charged. The gate of the weigh-hopper is equipped with an electric release and is operated from the scale-house. A Jackson electric vibrator, made by the Electric Tamper & Equipment Co., was attached to the weigh-hopper to quicken the discharge of the large stone aggregate. The concrete was dumped into 2-cu.yd. bottom-dump buckets of the company's own design, set on cars and pulled across the dam by a Lidgerwood steam hoist, the cars returning with the empties by gravity.

The records show that the maximum run in mixing and placing concrete was 546 yd. for a 12-hr. period. The day shift averaged more concrete placed than the night shift. Five hundred and forty-six cu.yd. or 284 batches in 12 hr. gives an average of 23½ batches per hr. Since their requirements called for the concrete to remain in the mixer 2 min., their mixing plant was arranged for a 3-min. cycle, allowing 1 min. for loading and discharging the mix. A 3-min. cycle allows 20 batches or 40 cu.yd. of concrete per hr.

The actual quantities of crushed materials produced by this plant are as follows:

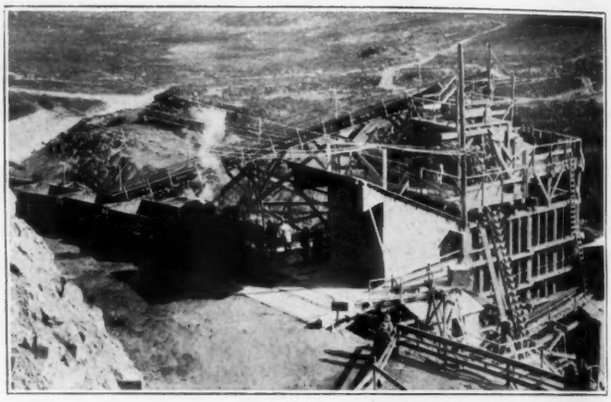
250 tons of stone, ranging between ¼-in. and ¾-in. in size, used in sidewalks and for the balustrade.

7,000 tons of stone, ranging between ¾-in. and 3-in. in size, used in columns, floor beams, and the deck slab.

58,000 tons of stone, ranging between 3-in. and 8-in. in size, used in the mass concrete.

20,000 tons of manufactured sand.

In addition to these quantities, there was approximately 12,000 tons of stone between ¾-in. and 3-in. in size, used for the construction of the road in connection with the dam contract, and about 1,600 tons of wasted material in the form of screenings and dirt. This gives a total of 98,250 tons of material produced. The plant was in operation approximately 168 days, giving an average run of about 600 tons per day. The crushing-and-screening plant was designed by Smith Engineering Works and was erected by the Vang Construction Co. The batching equipment was designed and built by the Stephens-Adamson Mfg. Co. and the Toledo Scale Co.



General view of plant and cement-storage bin.

L. E. Goerder and G. W. Smith were in charge of operations at the plant, and R. E. Martin was concrete technician.

Bureau of Mines Publishes History of Liquid-Oxygen Explosives

Use of liquid-oxygen explosives (L.O.X.) in blasting is thoroughly covered in Bulletin 349, recently published by the United States Bureau of Mines.

The history of the use of the explosive is given, along with its properties and its application to blasting operations. It was first used in Europe in 1897. In the United States experiments were begun on it in 1917 by the Bureau of Mines and it is now used in this country in various stone quarries and in coal-stripping operations.

Details of its use and cost at some of these operations are given and the results of tests made by the Bureau of Mines are included as well.

The book contains 82 pages, with illustrations, tables and charts, and may be obtained from the Superintendent of Documents, Washington, D. C.

Gravel Plant near Topeka Employs Cone Classifiers to Size Dredged Material

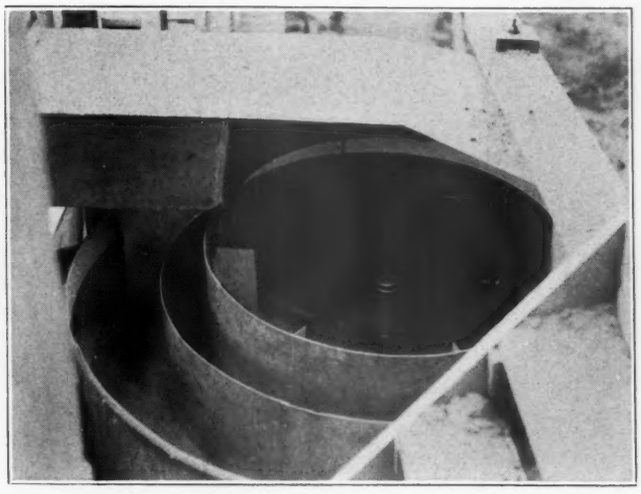
THE territory around and west of Kansas City, Mo., was one of the most active in the country last year in the development of sand-and-gravel production capacity. Many of the existing plants were enlarged or improved and a number of new plants were built. None of these plants are very large, but several have features which make them of unusual interest to other producers.

One of the most important of these new plants is that of the Victory Sand & Stone Co. at Topeka, Kan., which went into full operation in October, 1931. This plant is a dredging operation using cone classifiers for sizing the products as is the general custom in this section. A modern stock-pile storage and reclaiming system gives this plant storage and loading facilities not equalled by any other plant in this territory. The dredge was built about a year earlier than the new plant. The deposits in the river are similar to those found in and around Kansas City, which supply the bulk of the sand and fine gravel used there.

The property on which this plant is located is on the south bank of Kansas River, about 3 mi. west of downtown Topeka and in easy delivering distance of all parts of the city. Its location on the main line of the C. R. I. & P. Ry. also gives it unusual facilities for rail delivery.

A sand plant for the local market only has been operated on this property since 1928. The original plant was abandoned early in 1930 and the company reorganized. It was then decided to erect a new plant of greater capacity. This was designed and built under the supervision of M. M. Small, secretary and general manager of the company. C. A. Wood, inventor and manufacturer of the Wood

An aërial photograph of the Victory operations.



One of the classifiers, showing the curved-chute feed.

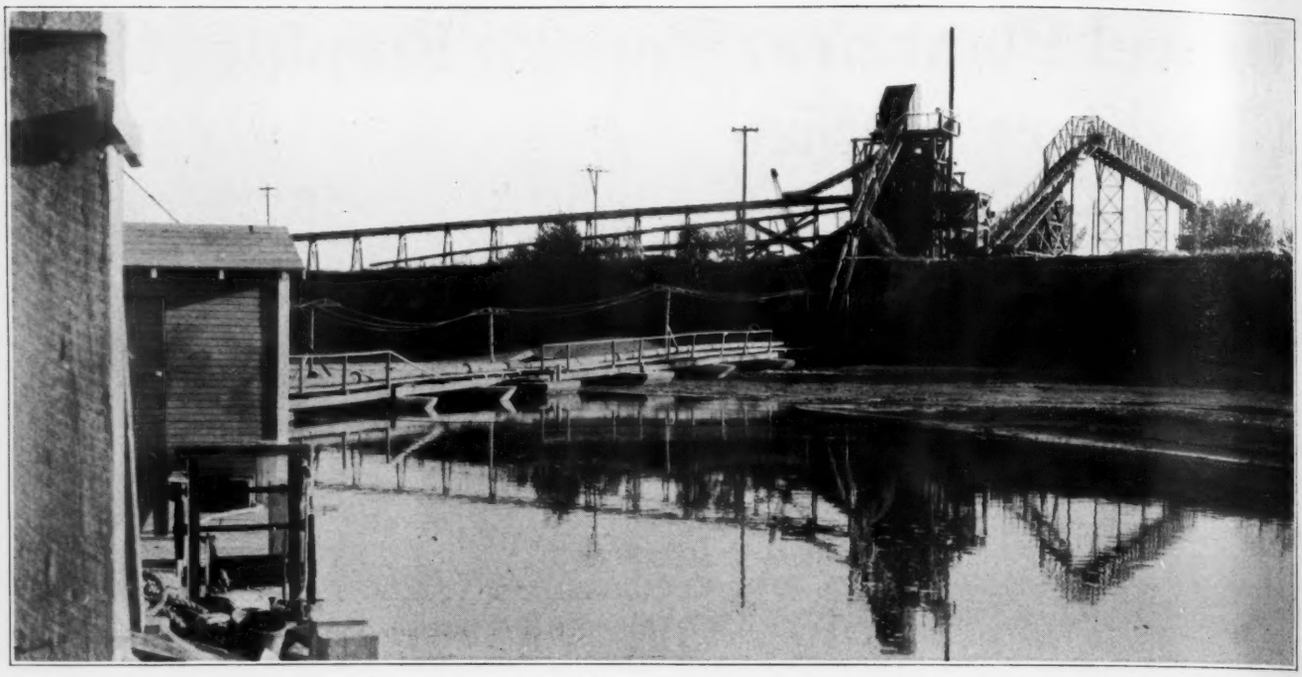
Flexible Storage-Reclaiming System Feature of River Operation

Auto-Vortex classifier assisted in the design of this part of the plant. The distance of 540 ft. from the edge of the river to the railway main-line right-of-way gave just enough room for the construction of a straight-line plant.

The dredge has an over-all length of 120 ft., most of which is taken up by the pontoons supporting the ladder and nozzle. The barges, pontoons, and superstructure are of wood. The 55-ft. Eagle-Swintek screen-nozzle ladder used to break up the deposit is supported from a timber framework and is gear-driven by a 20-hp. Westinghouse motor through a Medart friction clutch. A 2-drum Clyde hoist and a 1-drum English hoist are both belt- and chain-driven from a 15-hp. Wagner electric motor. These operate the shore-lines and raise and lower the ladder. Another English 1-drum hoist, driven by a small gasoline engine, can be used to operate the main shore-line in an emergency.

The 10-in. Amsco dredge pump is belt-driven by a 300-hp. Westinghouse motor. The flap valve is placed ahead of the pump instead of behind it as is the usual practice. This is claimed to make for easier priming of the dredge pump. The large rock in the deposit is rejected at the suction intake by the chain on the digger. A Barnes Mfg. Co. reciprocating pump, driven by a Wagner 3-hp. Motor, primes the dredge pump. A Goulds 2½-in. centrifugal pump, driven by a 5-hp. Westinghouse motor through a Grundy flexible coupling, furnishes cooling water for the pump bearing. Appleton electric conduit and outlets are used on the dredge.

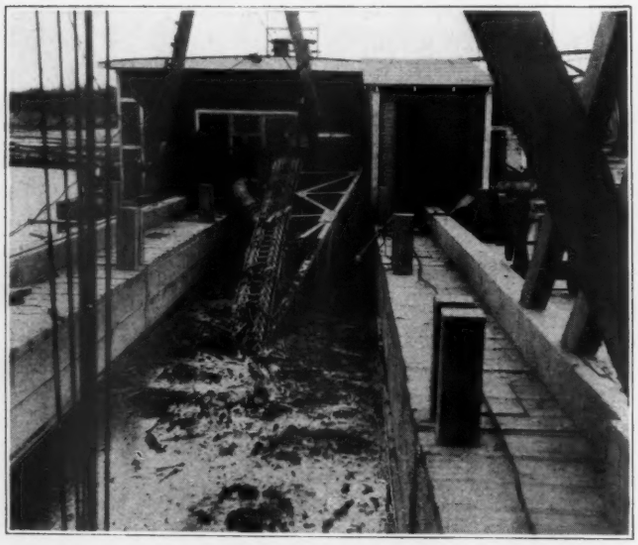
The dredge is now operating about 200 ft. from shore but the channel is gradually being drawn closer to shore so that eventually the dredge will



The plant and pipe-line as they appear from the dredge.

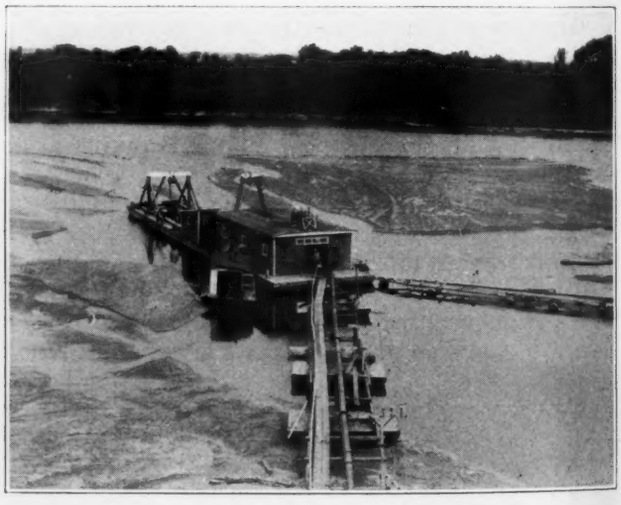
work in a permanent location near the shore. The dredge is pumping against a 51-ft. head. This, combined with the friction in the 300-ft. pipe-line makes a total head of 80 to 85 ft. An average of 125 tons per hr. of salable material is pumped to the plant. This does not include the waste material on which no check is kept. The dredge-line has flexible couplings only at the dredge and shore ends. All other joints are of the flanged and bolted type. Goodyear suction hose and flexible couplings and Knox Mfg. Co. hose clamps are used.

The dredge-line discharges at the plant on a



The 55-ft. screen-nozzle ladder on the dredge.

grizzly which has a slope of 35 deg. and is parallel to the pipe. the top of the pipe at the discharge point is bent down slightly to break up the solid stream to some extent. The top deck of the grizzly is in two 5-ft. by 5-ft. sections both with $\frac{7}{8}$-in. wire cloth. Underneath is a single section of $\frac{3}{8}$-in. cloth. The clay, sticks, and large gravel retained on the top deck are chuted to a waste pile alongside the plant. The material retained on the bottom deck goes to the No. 4336 Wood Auto-Vortex gravel-classifier which separates the silt and sticks and discharges them to a waste flume. The product of this cone contains sufficient sand to give the required



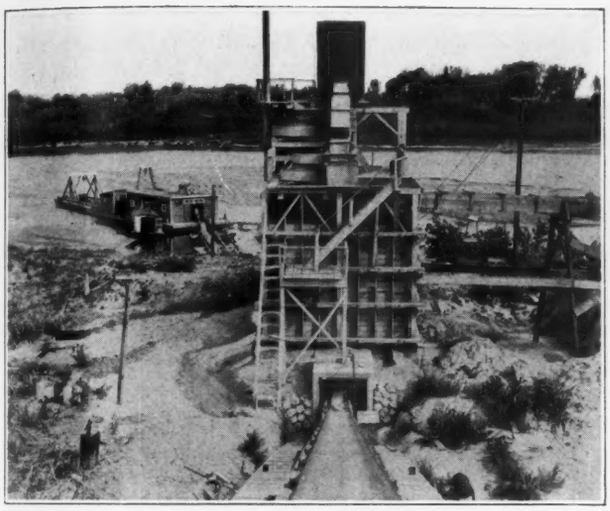
The dredge as viewed from the classifying building.

gradation for road material. This material is chuted directly into a bin.

The material through the bottom deck of the grizzly goes to the No. 6460 Wood Auto-Vortex classifier which separates the concrete sand. This also goes directly to bin storage, the overflow passing to the waste flume previously mentioned. This cone is handling about 130 tons of material per hr. The overflow from this cone goes to a No. 5048 Wood Auto-Vortex classifier which produces plaster sand. The sand goes to a bin and the overflow to

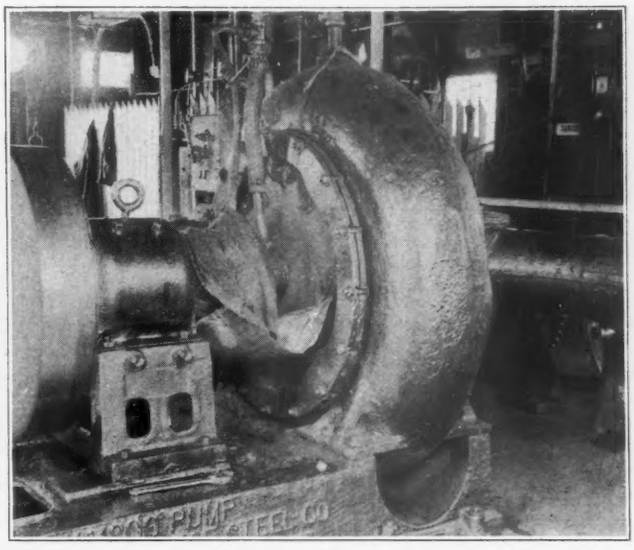
the same flume which discharges into the river at a point several hundred feet below the dredge. Although these two cones are only 10 ft. apart the sand has ample time to segregate in the flume connecting them. A zig-zag arrangement of the flume allows the material to travel 30 ft. before it reaches the second cone. Semi-circular plates at each angle of the flume prevent boiling and make this system possible.

The timber storage structure supporting the cones has a concrete foundation and floor and is divided into three compartments. One compartment, for coarse sand, has a capacity of 80 cu.yd. The



Classifying plant as seen from the stock-piling conveyor. Dredge in background.

other two have capacities of 40 cu.yd. each. The small amount of excess water passing through the cones is drained off through *louvres* in the side of the bin and from the bottom. Four sliding gates in a concrete tunnel under the bins feed a 20-in. belt conveyor. This has a total length of 460 ft. from center to center and is driven by a 20-hp. G. E. motor. It is almost flat for 35 ft. under the bins and is then inclined for 162 ft. to a height of 50 ft. above the tunnel level. At this point it flattens out for 303 ft. over the stock-piles. A Weller travelling tripper discharges to three storage-piles. This conveyor has three push-button controls: one at the sizing bin, one at about the middle of the gallery on the conveyor walk, and one at the loading bin. The conveyor is controlled by the man on the sizing bins, who has ample time to watch the plant, unload the



The 10-in. dredge pump, with belt drive at left.

various bins, and see that the tripper discharges the material on the various piles.

The concrete tunnel under the bins is 10 ft. longer in each direction than the bin structure to provide for the addition of other compartments in the future. The sizing plant is so designed that, when business conditions allow, three additional cones can be added and additional bins erected.

The entire stock-piling conveyor framework is of structural steel with bents supported on concrete footings which form the dividing walls between the stock-piles and are integral with the concrete reclaiming tunnel under the stock-piles. The tunnel

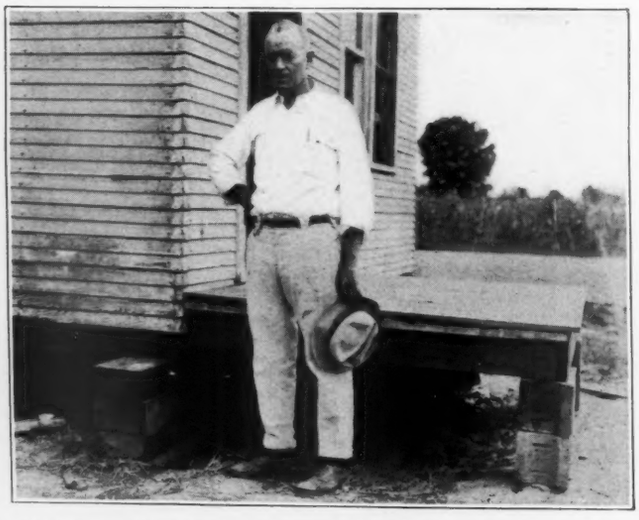
General view of stock-piles, overhead conveyor, and elevator to the loading bins.

Before the loading plant was completed, a crane rehandled the material to a truck-loading bin.

is 5 ft. by 6 ft. in cross-section and is 310 ft. long over all. There are two 100-ft. bays and an 83-ft. bay for the three sizes of material produced. The total live storage capacity is about 10,000 tons. Twenty-six openings with sliding gates in the top of the tunnel feed the reclaiming belt-conveyor, which is 20 in. wide and operates on 320-ft. centers. Any desired mixture of materials can be secured by proper setting of the gates.

The tunnel conveyor is inclined for a short distance at its discharge end and unloads into a Telsmith chain-bucket elevator which has 8-in. by 14-in. buckets and operates on 58-ft. centers. This discharges to a swivel spout so that the material from the elevator can be discharged as desired to any one of four compartments in the 350-ton loading bin. This bin structure is of timber with steel-rod cross bracing and its bottom is supported on steel I-beams. Timber columns on concrete footings support the whole. Railroad cars are loaded through drop chutes on one side and trucks are loaded from below the bins.

The distributing conveyor, tunnel conveyor and bucket elevator are all driven by individual motors of 20, 7½ and 10 hp. respectively. Cincinnati Rubber Co. conveyor belting is used on the belt-conveyors. Most of the conveyor idlers were furnished by the Webster Mfg. Co. except those on the reclaiming conveyor, which were furnished by the Conveying Weigher Co.



M. M. Small, secretary and general manager of the company.

The 1931 Kansas state specifications for fine aggregate for concrete allow 20 per cent. through 28-mesh and 5 per cent. through 48-mesh. For this reason the gravel and coarse sand are made coarser than required but are then mixed on the tunnel conveyor to meet exactly any specifications. By proper mixing a road-gravel mix or a sand-gravel mix for concrete can be made. A blotter-type gravel, containing from 40 to 70 per cent. finer than ⅛-in. for tar and oil roads, can also be produced.

Although the main storage and loading plant was not completed until October, shipments were made shortly after the classifying plant was completed. Part of the inclined section of the stock-piling conveyor framework had been erected at that time and a short conveyor had been installed from under the bins to this point. This was temporarily driven by a 20-hp. Westinghouse motor. This conveyor discharged through chutes either to stock-piles or to a small timber truck-loading bin. A Byers Master 1-cu.yd. gasoline crawler crane, with a ¾-cu.yd. Hayward clam-shell bucket, rehandled from the stock-piles to a second truck-loading bin. This system worked very satisfactorily until the plant was completed and allowed the shipment of any size or combination of sizes. The company owns a 3-cu.yd. Diamond T truck and 2-cu.yd. and 3-cu.yd. International trucks for local deliveries.

The plant office is located near the plant. The officers of the Victory Sand & Stone Co. are: R. N. Hall, president; George Stanfield, vice-president and treasurer; and M. M. Small, secretary and general manager.

Estimation of Free Calcium Oxide and Hydroxide Discussed

Methods of quantitative estimation of free calcium oxide and hydroxide are discussed in Special Report No. 17 published by the scientific and industrial research department of the British Building Research, London.

Two glycerol extraction methods, a lime-solution extraction method, and a calorimeter method are described in detail. The last two are new and one of the glycerol methods includes new variations. The glycerol methods are applicable to unhydrated cements, sand-lime bricks and hydraulic lime. The calorimeter method was devised for hydrated cements and is also applicable to mortars and concrete and possibly to fresh cements. The lime-solution extraction method is restricted to lime mortars and hydrated limes.

The bulletin may be obtained from the British Library of Information, 270 Madison Ave., New York, N. Y.

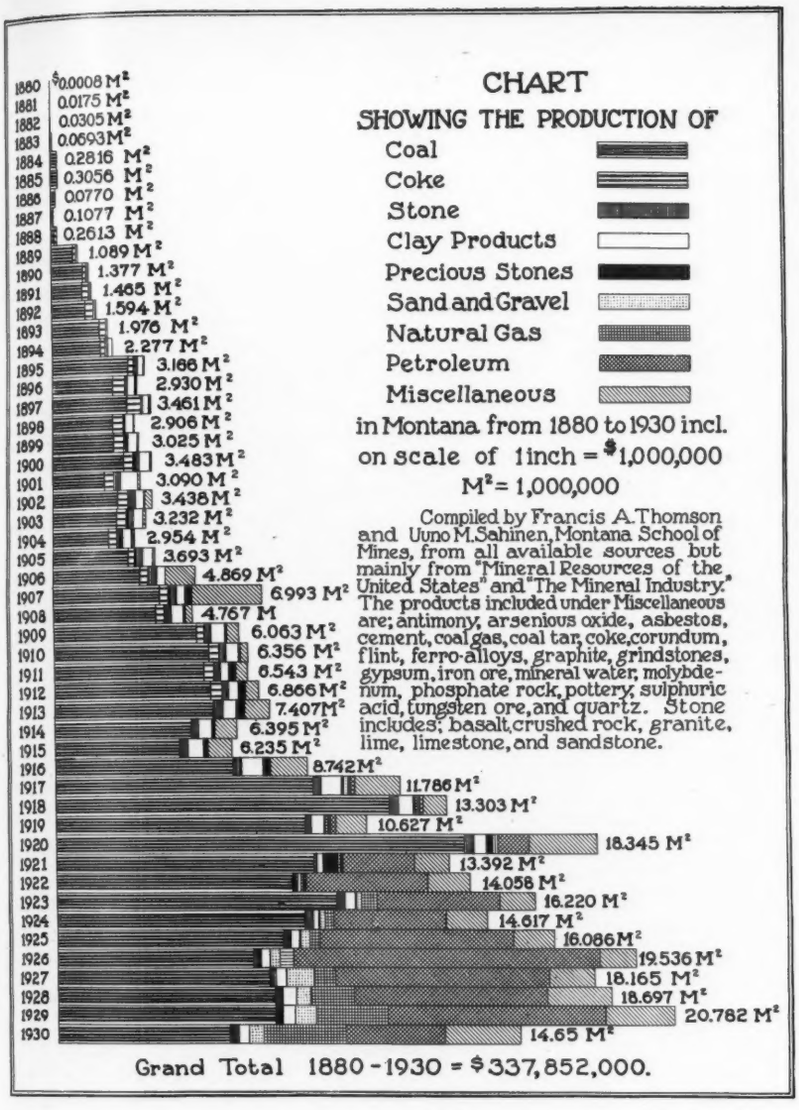


CHART
SHOWING THE PRODUCTION OF
Coal
Coke
Stone
Clay Products
Precious Stones
Sand and Gravel
Natural Gas
Petroleum
Miscellaneous
in Montana from 1880 to 1930 incl.
on scale of 1 inch = $1,000,000
M² = 1,000,000
Compiled by Francis A. Thomson and Uuno M. Sahinen, Montana School of Mines, from all available sources but mainly from "Mineral Resources of the United States" and "The Mineral Industry." The products included under Miscellaneous are; antimony, arsenious oxide, asbestos, cement, coal gas, coal tar, coke, corundum, flint, ferro-alloys, graphite, grindstones, gypsum, iron ore, mineral water, molybdenum, phosphate rock, pottery, sulphuric acid, tungsten ore, and quartz. Stone includes; basalt, crushed rock, granite, lime, limestone, and sandstone.
1880 $0.0008 M²
1881 0.0175 M²
1882 0.0305 M²
1883 0.0693 M²
1884 0.2816 M²
1885 0.3056 M²
1886 0.0770 M²
1887 0.1077 M²
1888 0.2613 M²
1889 1.089 M²
1890 1.377 M²
1891 1.465 M²
1892 1.594 M²
1893 1.976 M²
1894 2.277 M²
1895 3.166 M²
1896 2.930 M²
1897 3.461 M²
1898 2.906 M²
1899 3.025 M²
1900 3.483 M²
1901 3.090 M²
1902 3.438 M²
1903 3.232 M²
1904 2.954 M²
1905 3.693 M²
1906 4.869 M²
1907 6.993 M²
1908 4.767 M
1909 6.063 M²
1910 6.356 M²
1911 6.543 M²
1912 6.866 M²
1913 7.407 M²
1914 6.395 M²
1915 6.235 M²
1916 8.742 M²
1917 11.786 M²
1918 13.303 M²
1919 10.627 M²
1920 18.345 M²
1921 13.392 M²
1922 14.058 M²
1923 16.220 M²
1924 14.617 M²
1925 16.086 M²
1926 19.536 M²
1927 18.165 M²
1928 18.697 M²
1929 20.782 M²
1930 14.65 M²
Grand Total 1880-1930 = $337,852,000.

Fig. 1. Yearly production and value of Montana's nonmetallic minerals.

The Nonmetallic-Mineral Resources of Montana

By JOHN E. BLIXT
(Research Fellow in Geology)
Montana School of Mines

IT is a conceded fact that in by far the greater number of states in the Union the nonmetallic minerals, including the fuels, are of greater importance monetarily than the principal noble and basic metals of the mineral industry, namely, gold, silver, copper, lead, and zinc. In some of the western comparatively sparsely settled states, however, the nonmetallic-mineral production is subordinate due, obviously, to their geographic situations, to the lack of large-scale construction, to the scarcity of fabricating industries for the nonmetallics and to some degree to the relatively faint knowledge of the mineral industry as to the true extent, availability, variety, and value of these nonmetallics. Montana with her practically unlimited and varied resource of unsurveyed nonmetallic minerals and products has held her mining men's predominant interest centered on copper leadership and gold production.

As a comparison of present importance the total production of the primary metals gold, silver, copper, lead, zinc, and manganese in Montana from 1862 to 1930 amounted to approximately $2,625,192,000; while the total nonmetallic-mineral production, including mineral fuels and the minor metals amounted to $337,852,000 (Fig. 1). Subtracting from the latter figure the value for the fuels, $268,513,000, and the approximate value of the minor metals, $6,500,000 (of which arsenic greatly predominates), leaves a balance of $62,839,000 for those minerals and products commonly thought of as nonmetallic.

Cement.—Montana has two cement plants operated by the Three Forks Portland Cement Co., one situated at Trident, Gallatin County, and the other at Hanover, Fergus County in the foothills of the South Moccasin Mountains. The Trident plant was built in 1909-1910 and operated steadily until 1920; since then it has been in operation only from three to four months during the year. The raw materials for this plant are quarried in a large open cut on a hill slope less than ¼ mi. from the mill where the limestone and the shale occur in about the proper proportions for Portland cement. As the face exposed is large, the proportion of limestone to shale can be controlled with remarkable accuracy. Gypsum, however, is shipped in, as none occurs in the immediate vicinity. The age of the cement rock is probably Devonian, which here contains a lower magnesium content than common for that formation in Montana. The dry process of manufacture is used. The coal is obtained from the Bear Creek field. The capacity is 2,250 bbl. per 24-hr. day.

The Hanover plant was erected in 1918, operated intermittently until the spring of 1931 when it was closed. It will not be reöpened until the demand for cement justifies the operation of two plants. The raw material does not occur as natural cement rock, but the limestone is quarried about 2 mi. from the plant and is transported by an aërial tramway to the mill, where it is mixed in the right proportions with shale quarried near the mill. Gypsum is mined through a shaft near the plant, and fuel is obtained from Roundup. The wet process is used. The capacity of the plant is about 1,000 bbl. per day.

In addition to the production of cement, a gypsum mill, in operation the year around, produces hard wall plaster and land plaster (fertilizer) which is marketed in Washington, Montana, and adjoining parts of Idaho, Oregon, North Dakota and Wyoming.

In 1929 the two plants produced 568,000 bbl. and in 1930, 438,000 bbl. of cement. Necessarily Montana is the principal market, subordinate sales being made in western North Dakota and northwestern Wyoming. Of the Montana consumption approximately 40,000 bbl. is used annually for highway work a small amount in comparison with a 2,000,000-bbl. consumption in the state of Illinois for the same purpose.

Road Metal.—The Montana Highway Commission's policy "to get Montana cut of the mud" is no longer a policy but the fulfillment of a long-desired need. At the end of the present year it seems probable that two standard hard-surface highways, U. S. Highways No. 10 and No. 2 extending east-west across the state, will be near completion; and several north-south surfaced highways may likewise be finished. Short distances about the national parks and larger cities in Montana are now either oiled or paved, and country roads are becoming more passable.

Montana may well have good roads because an abundance of material may be obtained everywhere within satisfactory hauling distance. Perhaps the chief difficulty has been that its population is one-twelfth that of a state such as Ohio and its area is three times as large. The different road materials may be classified according to kind: (1) crushed gravel, which is the type of possibly 90 per cent. of the road metal, (2) crushed limestone, (3) crushed talus, (4) scoria, and (5) "granite sand."

The gravel occurs in several manners and is found widely scattered throughout the state. River gravels are found in all parts of the mountain area in stream valleys and in terraces, as for example channels of Yellowstone and Milk Rivers. Glacial gravels are found in abundance in the northern part of the state in the area once covered by the continental ice sheet. High-terrace gravels, deposited by a very ancient drainage system whose pattern was quite different from that of the present time, are found throughout much of central Montana. Limestone is being crushed at a point about 6 mi. east of Bozeman, Gallatin County; at Limespur, Jefferson County; and other localities where this type of material can be obtained more economically. In the mountain area, and in places where river gravels may not be obtained with ease, talus material (rubble resulting from rock weathering on hill slopes), consisting chiefly of argillite, quartzite, and rhyolite, are crushed and utilized. In that portion of eastern Montana which is covered by the Fort Union formation (Fig. 2) selected "scoria" is placed on the road in 3- or 4-in. size, and then crushed and packed by steam rollers. The red-colored scoria resembling brick is formed by the baking of shale beds by the spontaneous combustion of lignite coal beds near the surface, and by many is believed equal or superior to gravel as a surfacing agent. It contains a natural clay binder and is not easily dislodged from the surface of the road. In the vicinity of Butte decomposed granite, known locally as "granite sand," has been placed on the surface of the highways and a binder has been supplied by the natural clays along the roads and by oiling.

Clays.—The clay deposits of the state constitute another entirely unsurveyed nonmetallic resource of which there are abundant supplies of the brick and pottery varieties, and the closely allied bentonite. Although but few kilns are in operation at the present time because of market conditions, nearly all the larger towns and cities furnish brick for local building construction. The clays that are of the greatest importance occur geologically in the Cretaceous, Tertiary, and Quaternary formations, although extensive deposits are found in older formations. The pottery clay of the best quality is found in the mountain valleys and is of glacial origin. The Missoula, Bitterroot, Kalispell, and Thompson Falls valleys have beds of pottery clay from 1 to 20 ft. thick. In 1928 the value of the clay industry in the state was $24,000.

Bentonite.—A recent infant industry in the state is the utilization of the bentonite (fuller's earth) deposits. Beds, tabular vein-like bodies and irregular deposits of the material of apparently high purity are found to occur in many widely-scattered localities in three distinct manners or modes of occurrence. The first to be mentioned are the clear, homogeneous stratified beds interbedded in the Upper Cretaceous shales, principally in the Colorado and Bearpaw formations, extensive deposits of which nature are found near Glasgow, Valley County; Havre, Hill County; Glendive, Dawson County; and Great Falls, Cascade County. A second mode of occurrence, some products of which are satisfactory for many uses, is found interstratified in ancient lake beds and intermontane valleys in the Rocky Mountain Region, a commercial deposit of a somewhat similar type occurring along the main Butte-Anaconda highway about 15 mi. west of Butte. These two major types of occurrence appear to be formed by the devitrification and decomposition of volcanic ash or glass. A third mode of occurrence for the clay-like material heretofore unheard of is an occurrence in a granite area apparently as an alteration product of a dike. Such a deposit is being developed on Dry Cottonwood Creek, Deer Lodge County, 9 mi. east of Warm Springs.

Building Stone.—The state is well supplied with many varieties of good building stone, the extent and value of which, being entirely unsurveyed, can not even be estimated. East of the Rocky Mountains the rock is primarily sandstone of Cretaceous age; west of the Rocky Mountain building stones that would be suitable are found principally in the Carboniferous, Cambrian, and pre-Cambrian ages, with the exception, of course, of the Tertiary intruded granite of the Idaho and the Boulder batholiths.

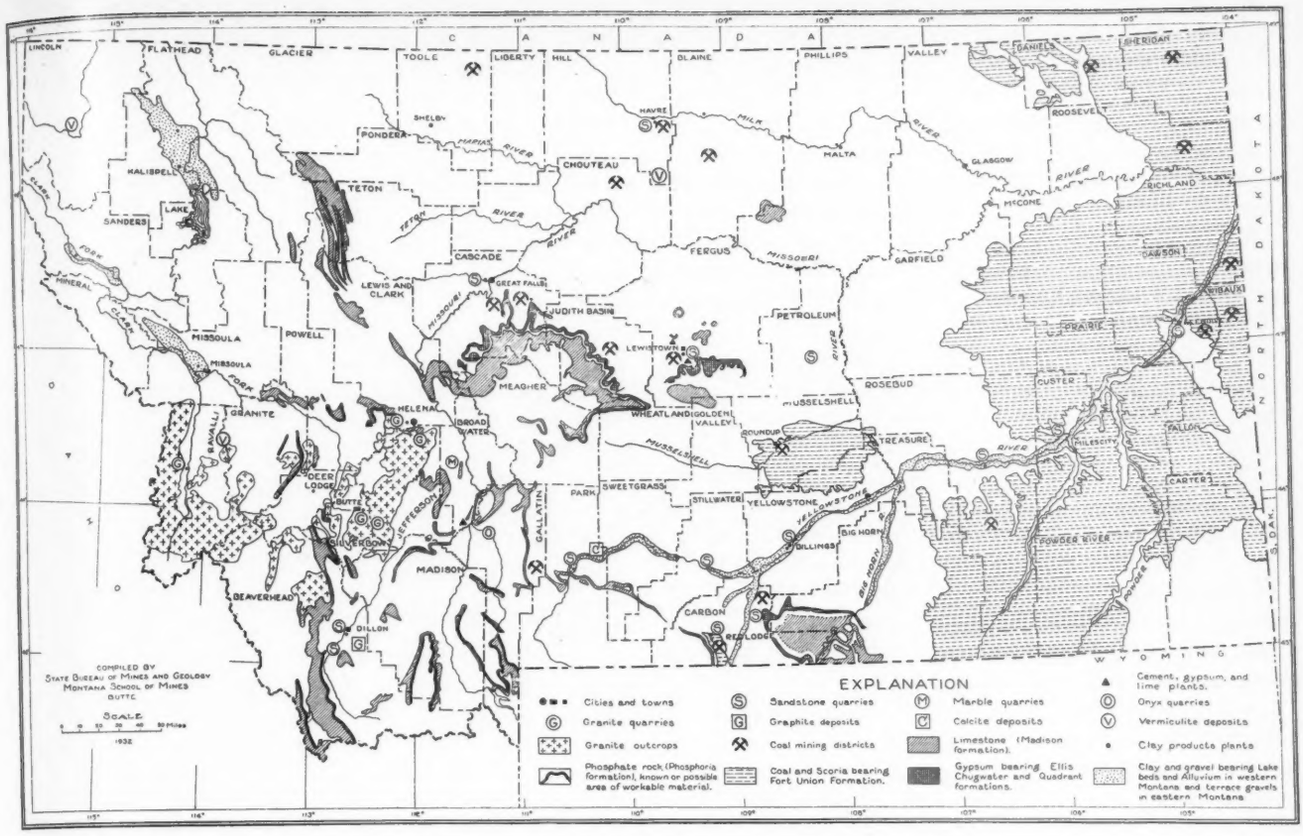


Fig. 2. Locations of deposits and developed resources in the state.

Granite.—Building granite is found in many counties in the Rocky Mountain region but notably in Silver Bow, Jefferson, Lewis and Clark, and Ravalli Counties. Silver Box County has several quarries, the one near Homestake probably being the largest. The stone from this locality has been utilized in Butte and near localities for building purposes and for monumental stone. In Jefferson County, granite has been developed to a small extent at Elk Park and Clancy. Lewis and Clark County is probably the largest producer of granite in the state and several quarries have been in operation from time to time near Helena. In 1932 the Lewis and Clark and Jefferson County quarries should enjoy greater production on account of increased building activities in the larger cities of the state. In 1928 the granite quarried was valued at $45,000.

The granite of the three first mentioned counties is from the Boulder batholith, the host of the principal metalliferous deposits of Montana or of the entire northwest. In many places the stone is objectionable from a quarrying standpoint as it is highly jointed and, therefore, blocks of suitable dimensions in large quantities are difficult to obtain from a single quarry.

The building granite from the locality near Hamilton, Ravalli County, in the Bitterroot Range is probably of the best quality in Montana. However, it has been but slightly developed due to its somewhat isolated geographic situation. Fig. 2 shows the extent of the granite of the great Idaho batholith in the northwestern portion of the state, and of the Boulder batholith between Butte and Helena.

Sandstone.—Sandstone has been quarried from time to time in 12 or 15 different counties. Of these, the quarries at Columbus in Stillwater County and at Billings, Yellowstone County, have been developed to the largest extent. Of the two the Columbus quarry is by far the more important. The stone here is of the highest quality in the state, has a bluish-gray color, is very fine-grained with an even texture, and has high transverse strength. The commercial bed in this locality is 20 ft. thick and of an undefined extent in the Upper Cretaceous (Lance) formation. In Beaverhead County a substantial sandstone is found which has a high crushing power, is very fine-grained, and is light gray in color.

The value of the sandstone products of the state is approximately $100,000 per year. Besides the Lance of the Upper Cretaceous sandstones the Eagle and Kootenai sandstones are being quarried.

Red-colored, highly-indurated sandstone is found in many of the mountain counties and makes an excellent building stone, especially when the colors are pronounced and enough of one kind of stone is found to warrant utilization for building purposes. Beaverhead County has probably the finest stone of this type in the state, and Missoula County undoubtedly the largest quantity. Some of the metamorphosed sandstone is reported to be of sufficient purity for the manufacture of silica brick.

Marble.—A fine-textured, durable building limestone or marble with a pleasing "black and gold" design has been found in widely-separated localities in Montana in the Gallatin formation of Cambrian age. The best-known locality from which the stone

has been quarried and marketed in Butte and elsewhere is near Townsend, Broadwater County. The marble is of high quality, apparently does not deteriorate from exposure to weathering, takes a high polish and is mechanically strong. Optimistically, it would appear as though it were but a matter of acquainting the public with this product to place it in an important position as a decorative stone.

White marble, that is, crystalline limestone, occurs in large quantities in the mountainous parts of the state. Such deposits are as yet entirely undeveloped and unsurveyed.

A second recently-discovered decorative stone, which may be known as "Montana semi-onyx," is being quarried in small amounts near Alder, Madison County, on Ruby River. It is a compact, extremely durable siliceous stone, concentrically banded in shades of red, brown, purple, and gray and should become valuable as an interior decorative stone where large blocks are not essential.

Volcanic ash usually comes under the category of abrasives but all that which has been utilized in the state has been firmly cemented and consequently used for building material.

Deposits of ash of varying purity and degrees of cementation are found widely scattered throughout the state in ancient lake beds of the mountain region, in beds in the Upper Cretaceous formations, and widely scattered in a fine state in the Lebo shale member of the basal Fort Union in the eastern and southeastern parts of the state. The most noteworthy ash-bed localities are Beaverhead, Cascade, and Dawson Counties, where the material attains a high degree of purity.

Phosphate Rock.—Phosphate-rock mining in Montana is a recent and rapidly-growing industry. Prior to 1930 but little phosphate rock was mined within the state, but in 1930 about 6,000 tons of raw rock was mined, and in 1931 production climbed sharply to 66,000 tons. Rock is being mined in the Garrison field, Granite County, the Elliston field, Powell County, and from a few scattered localities of less importance, the product being exported mainly to Trail, B. C., where a triple-superphosphate product is made. The manufacture of "Anaconda treble superphosphate" was begun at Anaconda, Deer Lodge County, in the summer of 1920 in a plant whose original capacity of 50 tons of raw material a day had been increased to 120 tons in 1927. Nearly the entire supply of rock for this plant comes from Idaho.

Natural rock phosphate is to be found distributed over much of southwestern Montana, eastern Idaho and northwestern Wyoming, and northern Utah. The U. S. Geological Survey estimates that 391,323,000 long tons of phosphate was available in Montana Dec. 31, 1925, the reserve in the western states being surpassed only by that of Idaho. Most of the phosphate rock is on public lands, although some has passed into private ownership, and the withdrawals in July, 1927, amounted to 279,944 acres. In addition to the land embraced in the phosphate withdrawals 3,833 acres had in 1927 been formally classified as phosphate land according to a report issued by the U. S. Geological Survey.

In southwestern Montana (Fig. 2) the phosphate rock occurs at two principal horizons in the Phosphoria formation of Permian age, one near the base and the other 20 to 60 ft. higher, which places it stratigraphically about the middle of the formation. The Phosphoria is from 25 to 100 ft. thick and overlies Quadrant quartzite and shale of Pennsylvanian age. The principal bed, which is the upper one, is a layer 4 to 5 ft. thick, averaging from 60 to 70 per cent. tri-calcium phosphate, certain layers running as much as 74 per cent. From these rich areas the beds become gradually thinner eastward, and also deteriorate in quality. The beds are characteristically lenticular in character and have been known to decrease in thickness from 4 ft. to a few inches in a short distance. Thus, intensive and extensive exploitation is necessary in order to determine the true extent of the bed. The lower phosphate bed is missing in the northern part of the Montana area, and the upper horizon lies next the quadrant. This upper phosphate member is in most places made up of several layers of phosphate rock separated by phosphatic shale, which is cherty or sandy and in places more or less carbonaceous, even being petroliferous in some localities.

The upper phosphate bed is readily distinguished from the lower by the bluish-white color of the float on the weathered surfaces, high specific gravity, and fetid odor when freshly broken, and the rock is generally finely oölitic, consisting of an aggregate of small rounded grains more or less firmly cemented by a matrix chemically of the same material or with a matrix of limestone. The chief gangue materials are phosphatic clay, shale, lime and quartzite. The gangue frequently carries a high percentage of phosphate but can not be mined with the high-grade rock as it presents an extremely difficult though not impossible problem of concentration.

The beds of the lower phosphate horizons are far less extensive and generally of a poorer quality than the upper ones. When a representative thickness of the Phosphoria is present, it lies near the base of the formation a few feet above the Quadrant quartzite. The beds wherever observed differ from the upper ones in that they consist almost entirely of phosphoratized brachiopod shells. A 4-ft. bed is found in Centennial Mountains along the Idaho-Montana line and is well developed in Quadrant Mountain, Yellowstone Park.

Phosphate rock on and near the surface shows the effect of weathering and evidence of the leaching action of ground water which has removed its more soluble constituents, particularly the lime. The result has been that the weathered outcrop contains a higher percentage of phosphoric acid than the same bed far below the surface. This degree of enrichment frequently determines whether or not the product is marketable, as it may increase the tri-calcium phosphate content from 1 to 5 per cent. or in some instances even more. This is at present an all-important factor and should be given se-

rious consideration before capital is expended in the development of deeply-buried deposits which may prove to be non-commercial. In all cases, therefore, the phosphate horizon should be exploited thoroughly before extensive production is attempted.

The specific gravity of the phosphate rock, which in 70-per cent. calcium-phosphate material averages 2.9, as compared with that of the gangue which averages 2.7, is a property that aids in distinguishing the richer rock. The percentage of phosphate content also varies with the intensity of the bluish-white color, the more highly colored the specimen is, the higher its phosphate content is likely to be. Thus, one familiar with phosphate prospecting can ascertain roughly the B. P. L. content by the relative weight and color of the float.

In western Montana the oölitic horizon, which contains the commercial beds, is in most places found immediately above the massive resistant quartzite. In many places it also lies directly below a cherty and quartzitic member of the upper Phosphoria which may be a continuation of the Rex chert of Idaho described by G. R. Mansfield of the U. S. Geological Survey in Professional Paper 152 on southeastern Idaho. Prospecting for phosphate in Montana is further facilitated by the presence of either one of or both these ledge-forming quartzite beds.

Vermiculite.—Vermiculite is a micaeous mineral relatively new in commerce whose geographic distribution outside the state is but little known. Montana has probably the largest and best-known deposits of this mineral in the United States, and at least three large deposits are known. A deposit in the Rainy Creek district 7 mi. northeast of Libby, Lincoln County, has been extensively developed and production has been on a commercial basis for a number of years. In 1930 the value of the product was $25,000. Another extensive yet practically undeveloped deposit is situated in Bearpaw Mountains, 22 mi. southeast from Boxelder in Hill County. The occurrence of a third deposit in the state, approximately 17 mi. east of Victor in the Sapphire Range, near the Ravalli-Granite County line, is likewise known.

The Rainy Creek deposit occurs in a pyroxenite and syenite stock intruding the Belt series, the stock extending over an area of 8 sq. mi. Widespread and unusual changes in the intrusive have been caused by hydrothermal action. The principal minerals thus formed, some of which are unusual, are muscovite, vanadium-bearing ægirite, vermiculite, a fibrous amphibole, and apatite high in fluorine, the aggregate of which commonly makes up from 7 to 10 per cent. of the pyroxenite country rock.

Vermiculite is a ferruginous, complex hydrated silicate of magnesium aluminum which, when heated, expands and exfoliates in a large degree, whereupon it assumes a golden or silvery luster.

The treated vermiculite, which in the Rainy Creek district deposit is marketed under the name "zonolite," has a multitude of uses, chief of which are fire, heat, sound, and electric insulation, and wall-paper decorating.

Gypsum.—Perhaps the first commercial use of locally-mined gypsum in Montana occurred in the year 1894; since then production has increased gradually. The state contains within its boundaries enormous deposits of minerable gypsum and has two operating gypsum-products mills, one at Heath and the other at Hanover, Fergus County; and two intermittently-operated cement plants at Trident, Gallatin County, and at Hanover utilizing raw gypsum. Thus, a tremendous reserve supply awaits the advent of an increased demand for the sulphate in the cement-making and building industries.

The economic deposits in Montana have been divided geographically into three general divisions: the north, central, and south fields. These fields follow the contours of the mountain uplifts of central and southern Montana, where the gypsum is found principally in the Pennsylvanian, Triassic, and Jurassic formations. In the northern field, which is in the central part of Montana, three separate deposits are known: one near Armington and Kibby west of Great Falls in Cascade County; another along the southwest border of the South Moccasin Mountain near Hanover; and a third in the Big Snowy Mountains near Heath. The central and the one of least importance is situated near Limespur, Jefferson County. The south field, not far from the Wyoming line, is geographically near Bridger, Carbon County, and in the border of Pryor Mountains, a part of the northern extension of the Bighorn uplift.

The principal beds in the northern field are situated in a belt of rocks of Jurassic (Ellis) and Pennsylvanian (Quadrant) ages which girdle the Big Belt and Little Belt Mountains on the north and east. Thus, it is reported the gypsum beds may be traced intermittently from the emergence of Missouri River from the Big Belts to the Castle Mountains, a distance of more than 200 mi.

During the first decade of this century the northern part of this field was an active producer, with a plant, which manufactured stucco, plaster, and calcimine for consumption largely in the states of Washington and Montana, in operation near Armington. Since that time operation in that field has been discontinued. The beds of gypsum in the vicinity of Armington are between 5 and 30 ft. thick.

Gypsum is being mined in the South Moccasin Mountain deposit for the gypsum plant and for the cement plant at Hanover whenever it is in operation. The gypsum here occurs in two beds about 20 ft. apart both which range in thickness from 6 to 10 ft. The Big Snowy Mountain deposit near Heath, with beds from 5 to 10 ft. in thickness, supplies the raw product for the gypsum plant in operation there. The principal product is wall plaster. This deposit likewise occurs in the Ellis formation interbedded with limestone, limy shale and variegated clay shale.

The central field is situated about 2 mi. east of Limespur station on the main line of the Northern

Pacific R. R. At this locality gypsum as well as limestone has been quarried recently for the Great Western sugar refinery at Billings.

In the southern field there are reported three separate exceptionally fine outcrops in Carbon County. The first and smallest of the three is situated about 8 mi. southeast of Bridger, where a third gypsum plant was in operation simultaneous with early production from the Armington mill. The bed at this point is from 10 to 12 ft. thick. The second outcrop, about 20 mi. southeast of Bridger near the Wyoming border, has never been developed to any extent, but is reported to be of high quality. It is of greater extent than the first-mentioned bed, cropping out over a distance of from 1 to 2 mi. and attaining a thickness of 50 ft. The third bed, which is reported to be by far the most promising and largest in the field and probably the one of greatest average thickness in the state, is situated about 16 mi. southeast of Bridger. This bed, like the others, follows the contour of Big Horn Mountains, striking in a generally northerly direction. From the southernmost exposure of the bed, where it is 20 ft. thick, a gradual thickening is noticed northward until a maximum of 50 ft. is reached at a point 1½ mi. distant, from which point further northward the bed again thins gradually to 15 ft. at a point an additional 1½ mi. in a northerly direction where it goes under cover. The gypsum-bearing beds in the southern field overlie the Quadrant "red beds" and are of Triassic (Chugwater) age, being an extension of the Big Horn basin deposit in Wyoming.

Several other deposits of pure gypsum in Montana have been reported from Beaverhead County as well as from other localities.

Lime.—At present there is but one large lime kiln in operation in the state, which is near Elliston in Powell County. In 1918 at least 12 small kilns supplying lime for coal consumption were in operation at Elliston; Lewistown, Fergus County; Red Lodge, Carbon County; northwest of Dillon, Beaverhead County; at Maiden Rock, and Divide, Silver Bow County, and at Limespur near Whitehall, Jefferson County. Kilns have also been operated southwest of Big Timber, Livingston, and Bozeman, Gallatin County; and at Lime Kiln Hill, Silver Bow County, south of Butte.

Limestone outcrops are widely distributed over the state, except in the eastern part, where they are overlain by thick sandstones and shales of the Cretaceous formations.

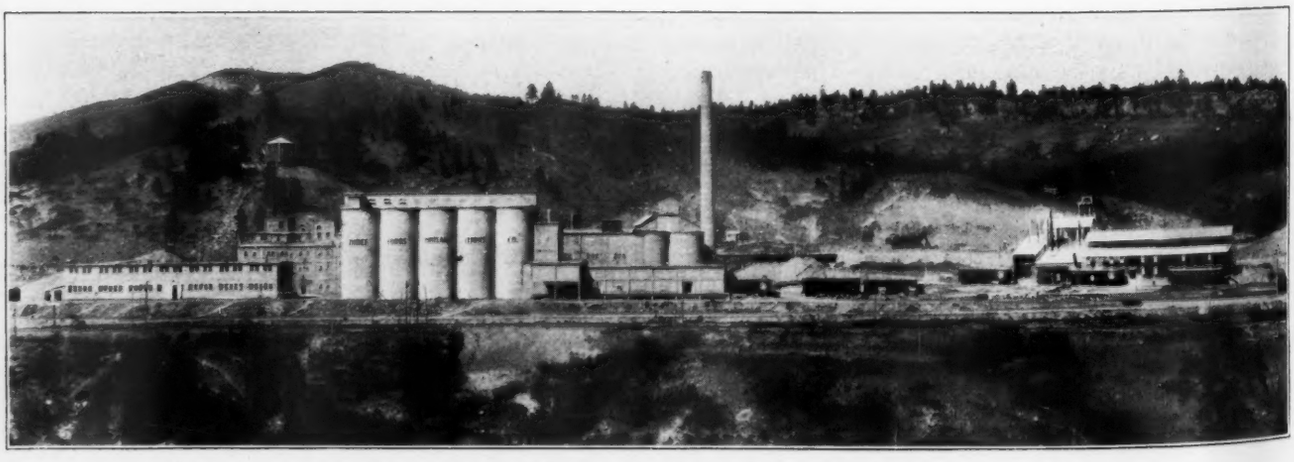
Travertine, or hot-spring deposits, composed of practically pure lime carbonate, are numerous in the state, especially in the central portion. One such mass, known as the "Park," 15 mi. north of Lewistown, between the North and South Moccasin Mountains in Fergus County, covers an area of 6 sq. mi. and has an average thickness of 250 ft. Another extensive deposit is found near Gardiner, Park County, and appears to be suitable for building stone.

With the exception of the travertine which is of Tertiary age, the limestones that are suitable for burning are of Mississippian age (Madison limestone), the pre-Cambrian, Cambrian and Devonian limestones not being suitable on account of their high magnesium contents.

The value of the limestone has increased gradually from $33,000 in 1918 to $113,000 in 1928.

Graphite.—A deposit of graphite, which is the only known occurrence of commercial importance in Montana, is found approximately 9 mi. southeast of Dillon, Beaverhead County, on the south end of the Ruby Range at an elevation of 9,000 ft., at a locality known as Crow Point. The graphite has been compared in purity and general geologic occurrence to the Lead Hill deposit, New York State, and the well-known Ceylon deposit.

Paleözoic limestones and quartzites underlain by pre-Cambrian quartz schists and slates, have been intruded by granite and pegmatite, which has formed certain contact metamorphic rocks of quartz, garnet, and pyroxene. The graphite veins vary from a fraction of an inch to 6 in. in thickness and occur in pegmatite veins, in bunches with the contact minerals, disseminated in schists, and in veinlets in granite. Of interest in regard to the manner of deposition is the fact that the veinlets traverse the granite but are cut off sharply at the contact with the limestone where it occurs in a finely-disseminated condition. The veinlets in the



The Hanover, Mont., plant of the Three Forks Portland Cement Co.

granite are remarkably clear cut and contact metamorphism does not seem to have played any part during mineralization. The selective association of graphite and pegmatite is well shown where a pegmatite dike cutting limestone is one-half graphite, although no graphite occurs in the adjacent limestone. Of interest, likewise, is the condition that occasionally graphite plates cut across single microcline crystals apparently without reference to planes of crystal cleavage, a condition which symbolizes contemporaneous deposition.

In 1931 but a small amount was mined, milled and marketed for local consumption.

Calcite.—A new and apparently successful enterprise is the mining of calcite in Montana for stock and chicken grit. Calcite veins in general are plentiful in the state, but pure calcite, that which is free from magnesia and iron, is less common. A number of calcite veins, some of which are of commercial importance, are present over a narrow strip 35 mi. long, extending intermittently in a northwesterly direction from Upper Deer Creek, Sweet Grass County, through Springdale and Hunter's Hot Springs to Wilsall, Park County. Portions of these veins contain clear, flawless, Iceland spar, the optical variety of calcite which is of relatively rare occurrence in the United States. Pure calcite is in demand by the chemical industry.

Abrasives.—Corundum, other than sapphires, has not been mined in the United States for the past twenty-six years, except for a small production from North Carolina and Georgia during the World War, the main supply of this natural abrasive coming from Transvaal, South Africa. A deposit of abrasive corundum of possible industrial importance is found in south-central Gallatin County, in an area of gneissic rocks on the headwaters of Elk Creek in a group of foot hills between Gallatin valley and Spanish Creek basin. The corundum occurs in crystals from a fraction of an inch to 8 and 10 in. in length in a gneissoid-syenite intrusion, the corundum bearing portion of which is a dike 2 to 3 ft. in width which can be traced for 2 mi. It is very probable that with the present advanced methods of ore dressing the corundum may be successfully concentrated.

A deposit of garnet is reported to occur 3 mi. southeast of Alder, Madison County, in the foothills of the Ruby Range. The abrasive is apparently of good quality, principally almandite with minor amounts of pyrope. It occurs in an area of sedimentary pre-Cambrian gneiss and schist cut by a series of acid dikes, varying in composition from alaskite through quartz-garnet to pure quartz. The garnet is said to occur disseminated in a band from 60 to 250 ft. in width, having a vertical exposure of approximately 400 ft., and can be traced along the strike for 2,000 or 3,000 ft. The material appears amenable to concentration and is unique in that it carries a small amount of disseminated free gold. The deposit is as yet practically undeveloped, having been but recently under consideration.

Asbestos.—A deposit of chrysotile asbestos with commercial possibilities is situated near Cliff Lake adjacent to the Montana-Idaho border. The asbestos, although of short fiber, appears to be amenable to spinning and is made up of green, silky cross-fibers. The deposit occurs in serpentine in rocks of pre-Cambrian age. A variety of tremolite asbestos occurs in the Rainy Creek district north of Libby, Lincoln County.

Monazite.—This rare-minerals phosphate occurs in placer gravels and has been reported from Princeton, Granite County; Norris, Madison County; and in other placers in the extreme western part of the state.

Muscovite.—A locality about 8 mi. southeast of Dillon, Beaverhead County, is said to have yielded large plates of white mica; it has also been reported from near Barker, in the Little Belt Mountains; south of Bozeman, and other localities. Elsewhere the product is of the herringbone type and thus not desirable commercially.

Startling New Theory Developed on Mechanism of Lubrication

As an outcome of the work of the lubrication engineering committee of The American Society of Mechanical Engineers, a new and startling theory of the mechanism of lubrication has been developed which was presented in a paper before an informal conference at the Engineering Societies Building on June 1, under the auspices of the A. S. M. E. The practical importance of this theory lies in the fact that it proposes novel bases for the evaluation of the lubricating properties of oils and greases, and incidentally offers an explanation for a number of matters that have been puzzling lubrication engineers in the past. The development of this theory has been made possible by discoveries of new features in the behavior of lubricants, which in turn have been made possible through tests made on a new machine for investigating phenomena of lubrication that was erected by the Sperry Gyroscope Co.

Briefly, according to this theory a layer of oil is formed on the surface of the metal, the thickness and strength characteristics of this layer being determined by the character of the lubricant and of the metal. This layer, in turn, pumps oil up into the crevices of the metal under an enormous pressure. In the course of contact with the bearing surfaces on the journal and the brasses (the same especially applies to ball and roller bearings as well as Kingsbury bearings), the free film plays no part as a means of separating the surfaces of the metal. This is done by the newly discovered powerful adhering layers of lubricant, and when, in the course of operation of the bearing, these are wiped off, they are immediately restored by the oil ejected under enormous pressure from the crevices in and under the metal surfaces. The remarkable circumstance is therefore established that any lubrication is essentially high-pressure lubrication.

(*Continued on page 40*)

Builds for Permanence After Structural Failure of Old Plant's Timbers

California Gravel Firm Makes Much Use of Concrete After Collapse of Building

By W. E. TRAUFFER

THE aggregate needs of the larger cities in California are mostly supplied by large concerns operating numerous producing plants near these cities and distributing yards in them. This is especially true in and around Los Angeles. There are, however, many small plants operating near that city which have no rail-shipping facilities and supply materials for purely local use.

A typical plant of this type is that of the Santa Paula Rock Co. at Santa Paula, Cal., a town of 7,500 inhabitants located in Santa Clara Valley about 45 mi. northwest of Los Angeles. This plant has a capacity of 40 tons per hr. and, like many others in this valley, obtains its material from the bed of Santa Clara River. The plant is on the north bank of the river safely above flood level. Most of the material produced is used for local building and road construction.

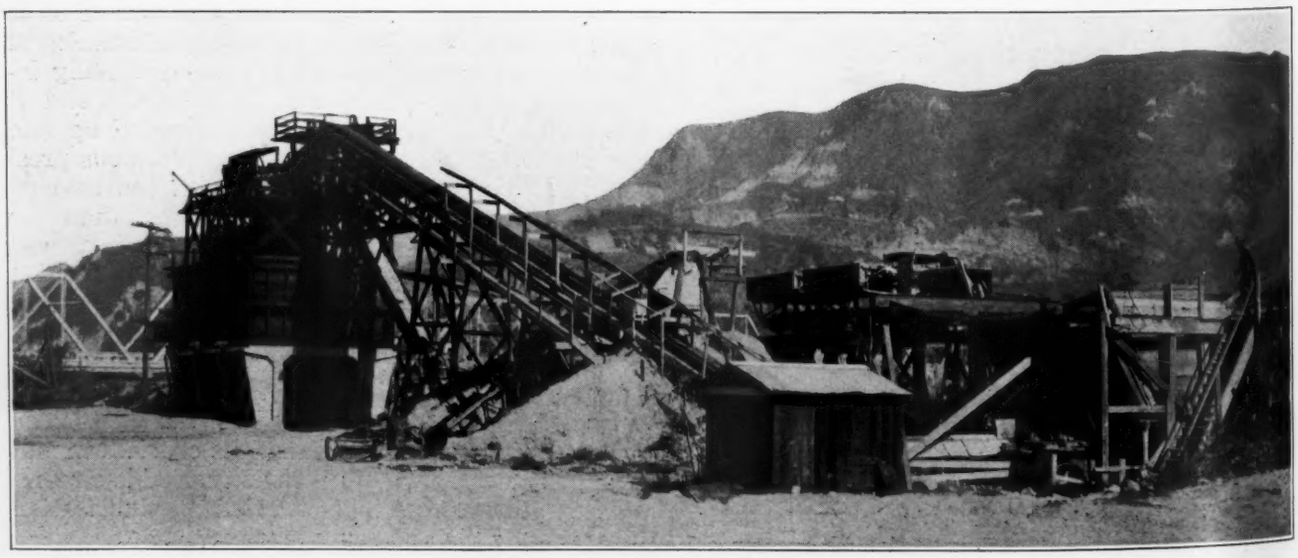
Truck being loaded beneath the bins. Note the double-end gates.

The deposit which supplies the plant during dry seasons is located on the south side of the river about 3,000 ft. from the plant. The material runs about 75 per cent. over ¼-in. in size. The drag-line used for digging the material can excavate only to a depth of 18 ft. but there is good gravel at greater depths. The water-level is only 2 to 3 ft. below the surface, thus allowing the gravel to be handled wet for greater cleanliness.

Tracks on a gravel fill across the dry river bed connect with the plant. Surface water seeps through the fill. When the rainy season from November to February each year brings its floods, the tracks are taken up and the fill is washed away, to be replaced in the spring when the water recedes. Deposits on higher ground near the plant supply gravel for winter operation.

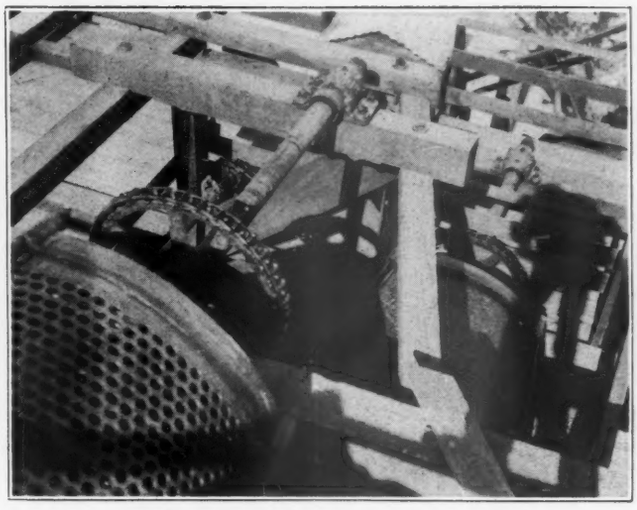
A Koehring gasoline crawler crane, with a 50-ft. boom handling a 1-cu.yd. Page drag-line bucket, loads two 4-cu.yd. Western side-dump cars drawn by a Plymouth 8-ton gasoline locomotive. The cars are drawn up an inclined fill to the plant, where the fill becomes a trestle, and they are discharged over a 10-in. rail grizzly into a 12-cu.yd. hopper alongside the trestle.

A reciprocating feeder passes the material from the hopper into the 14-in. by 38-in. Alloy Steel & Metals Co. roller-bearing jaw crusher. This is set



The Santa Paula plant, with the range in the background.

Cone reduction crusher and return belt-conveyor.



The chain-driven conical sizing screens.

to 2-in. and discharges on a 24-in. inclined belt-conveyor which operates on 156-ft. centers and leads to the top of the plant. The conveyor discharges to a rock box from which the material is fed to a double-jacketed Bodinson conical screen. This has a 56-in. by 66-in. by 6-ft. long outer jacket with 1¼-in. perforations. The inner jacket is 6 ft. 6 in. long and has 1¾-in. perforations. A third jacket with 1-in. openings can be added when demand requires.

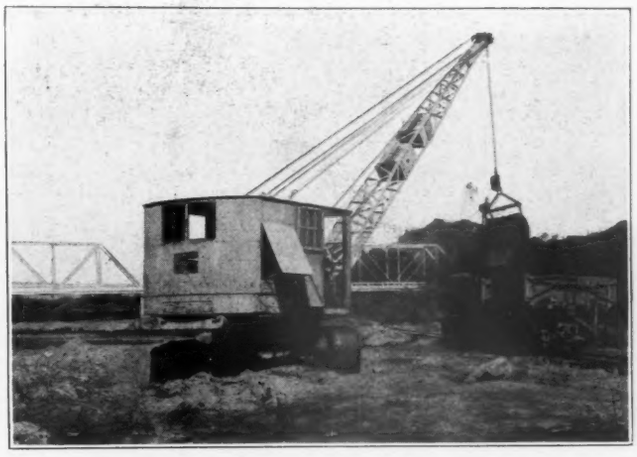
The 1¾-in.-plus material ordinarily goes through a chute to a Symons 2-ft. cone crusher alongside the plant. This crusher is set to 1-in. and discharges to an 18-in. inclined belt-conveyor which operates on 77-ft. centers and feeds back to the main conveyor to the top of the plant. When coarse rock for roads or concrete base is required the 1¾-in.-plus material from the first screen can be fed to another conical screen with 2½-in. openings. The 2½-in.-plus stone then is chuted to the Symons crusher and the 1¼-in. to 1¾-in. stone drops directly to a bin.

The material passing the outer jacket (minus-1¼-in.) goes to another conical screen with ½-in. and ¼-in. openings on the inner and outer jackets. The two large sizes (½-in. to 1¼-in.) and (¼-in. to ½-in.) go to bins. The sand goes to a rotary sand-washer of a type common on the Pacific Coast. This washer is set on a slope of about 39 deg. and has a 48-in.-diameter wheel with 12-in. curved blades. The sand goes to a bin and the silt and water overflow are flumed to a waste pond.

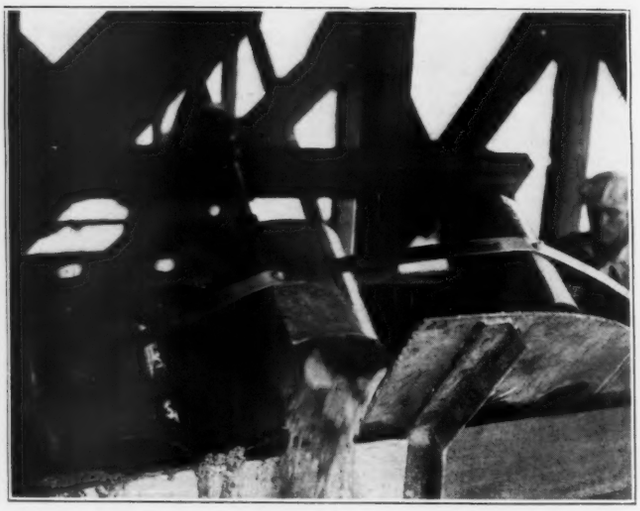
The bin supporting the screening plant has a total capacity of 300 cu.yd. It is divided longitudinally, one division having three compartments of 50-cu.yd. capacity each, the other division having three compartments of 25-, 50- and 75-cu.yd. capacity, respectively. Each compartment has a single gate, except the large one which has two gates. These are so located that trucks in the single tunnel under the bins can be loaded from either pair of end bins at the same time. An arrangement of three single gates in the center allows loading the same truck from the two center bins and the large bin. The double sliding gates used on the end bins are of the company's own design.

Later it is planned to put in a second sand-classifier for the production of fine sand. The large bin will then be divided into two. Space also has been left for a second fine-sizing screen. Other improvements will include the installation of air-cylinders for remote control of the bin gates. A shuttle conveyor and four side gates will be installed to feed to a batch bunker, which will be used for aggregates mixed to special specifications. When all these improvements are completed the plant will be able to produce seven sizes of material, including four grades of rock from ½-in. up, and three grades from ¾-in. up, in addition to pea gravel and two grades of sand. Its present capacity of 40 tons per hr. will be considerably increased.

The company owns two 5-cu.yd. Autocar trucks in which deliveries are made. Other trucks are hired as needed. A considerable amount of sized material is kept in stock-piles near the plant, a Koehring gasoline crane, with a ¾-cu.yd. Owen bucket, rehandling from them to the trucks. This is supplemented by a stock-pile loader of the company's design and construction, which loads at the rate of 2 cu.yd. per min. The loader is electrically



Crawler drag-line loading gravel to cars in pit.



The rotary sand-washer in operation.

Stock-pile loader rehandling material.

welded throughout and is operated by an old motor-truck power-plant through a simple system of controls. A Buffalo truck scale at the office near the plant is used for weighing truck shipments.

The primary and cone crushers are belt-driven by 40-hp. and 30-hp. motors respectively. The main conveyor is driven by a 25-hp. motor and the return conveyor by a 7½-hp. motor, both through gear drives. The feeder is chain-driven from the tail pulley of the main conveyor. The three revolving screens are chain-driven from a line-shaft driven by a 10-hp. motor and the sand-washer is belt- and gear-driven by a 7½-hp. motor.

The first plant operated at this location was built in 1924 and operated continuously until June 9, 1931, when the plant collapsed due to the weakened condition of the timber flooring under the bins. The plant was immediately rebuilt to the company's design and went back into operation on Aug. 15, 1931. The present structure is built so that there will be no repetition of the previous disaster. The bins are of timber braced with steel and are 22 ft. wide and 38 ft. long. They are supported on a reinforced-concrete foundation, designed so that the weight of the bin is evenly balanced on the supporting piers, which rest on a concrete mat forming the truck runway and support the concrete floor of the bin. All the reinforcing steel was electrically welded with a Lincoln Electric Co. "Stable Arc" welder which is usually used for repairs.

Water dripping from the bins is caught in drip pans and carried away to the waste pond. A 3-in. Byron-Jackson centrifugal pump furnishes water for washing the gravel from the near river bed. The pump is driven by a 15-hp. motor. General Electric motors and electrical equipment are used exclusively. Pioneer conveyor belting is used on both conveyors. The Conveyor Co. furnished the conveyor idlers and the feeder and the screens were furnished by the Bodinson Mfg. Co. A machine-shop on the property contains a lathe, forge, drills, and other equipment for making practically any plant repairs.

The officers of the Santa Paula Rock Co. are: A. N. Vela, part owner and manager; Ramon Prieto, part owner; J. E. Leary, superintendent; M. Rogers, sales manager.

A close view of the primary crusher.

Confident in Return of Prosperity, Producer Expands Operations

(*Continued from page 18*)

All batching and handling equipment for this unit was furnished by the Heltzel Co. of Pittsburgh, Pa., and includes a 4-cu.yd. Aggrabatcher which is supplied with materials from a 3-compartment 75-cu. yd. steel hopper. Cement is handled in bags and is stored in car-load quantities in the storeroom already mentioned. When the transit-mixer equipment is in operation, bags of cement are opened and dumped into an elevator, which sends the cement to an overhead supply hopper which feeds the cement batcher.

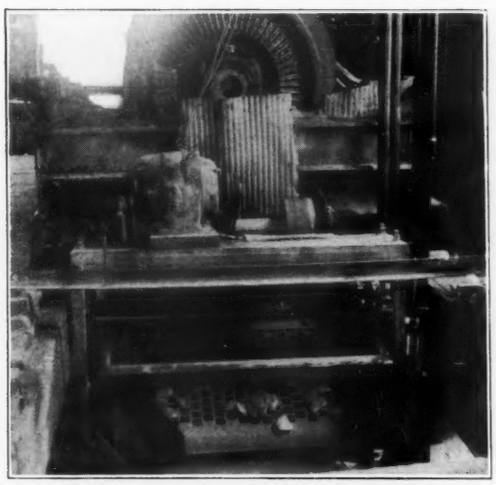
For dry-batch aggregates truck-delivery accommodation, the company has erected a special concrete truck-loading bin containing three compartments, beneath which are four Heltzel measuring devices, two for quantity measurement and two for weight measurement. Trucks are loaded through a lane provided between the supporting columns of the bin, and the Heltzel units are mounted in positions directly above the trucks.

The aggregate-batching silos during construction, showing elevator and housing.

End view of the batching plant, indicating loading-tunnel construction.

Ohio Gravel Concern Finds Dry-Batched Aggregates Business Increasing

FACILITIES for the accommodation of its ever-increasing truck delivery of dry-batched aggregates were recently placed in service by the Willey-Ruckstuhl Co., Miamitown, O., which is located near metropolitan Cincinnati. The new equipment consists of 3 concrete-stave silo-bins, each having a capacity of 100 tons, two batching hoppers, and a scraper-elevator system for the handling of aggregates from ground storage.



The vibrating-screen installation.

The new equipment was built adjacent to the company's present gravel plant. It will eventually comprise a separate unit as the present tipple will be razed following the completion of a modern one at a new location some distance away. Construction of the new tipple is planned for this year.

The three concrete-stave silos rest on a reinforced-concrete subway which also houses the batching hoppers and provides a passageway for the trucks. The subway is 10 ft. wide, 20 ft. high and 30 ft. long and has 8-in. walls. Each silo is 15 ft. in diameter and 30 ft. in height. A wing extending from the subway serves as a housing for the elevator, which is built to receive materials from a scraper. The latter discharges into a small pit at the foot of the elevator housing. Webster 15-in. by 8-in. by 10-in. sand buckets are used in the elevator.

Midway between the subway roof and driveway level, a platform was built to serve as a walkway around the batchers. It consists of a number of 8-in. I-beams spanning the subway walls and is covered with planking. For the batching equipment two Blaw-Knox 2-cu. yd. units were purchased. One unit is of the two-compartment aggregate type, the other a single-compartment unit for sand; both are equipped with Fairbanks beam scales. On a near platform bag cement is stored for distribution to the trucks carrying aggregates.

Present screening facilities at the Willey-Ruckstuhl Co. plant were augmented for the 1931 season through the addition of a Deister Plat-O vibrating screen. This new unit, 4 ft. by 7 ft. in size, has three decks for the final classification of washed gravel. It is equipped with Tyler screen cloth and is powered by a 7½-hp. motor through a belt drive. After the new tipple is erected the operation will be highly efficient and modern in every respect.

The Willey-Ruckstuhl Co. is well known within the Cincinnati building industry. The company has been producing aggregates for a number of years from its two sand-and-gravel plants located at what is known as Willey's Pit in Miamitown. The members of the firm are S. E. Willey and E. W. Ruckstuhl and offices for the transaction of business are maintained at 3427 Cheviot Ave., Cincinnati.

Do Admixtures Have a Legitimate Place in the Making of Concrete?

By L. A. PERRY
Consulting Engineer
Pioneer Sand & Gravel Co.

THE subject of concrete admixtures so frequently overdone in advertising and generally handled by engineers on the end of a long pole, as one would a garment worn during an encounter with a resourceful skunk, deserves at least to be discussed with frankness and in a spirit of common fairness. The writer, feeling that his association with the manufacture and distribution, to almost every usage, of about 2,000,000 tons of pre-mixed concrete in the past seven years has given him an intimacy with the subject, is moved to present such a discussion.

The term "admixture" is here used in its specific sense and does not include floor hardeners, penetrants, burned-in ingredients, membranes, and the many construction specialties, such as patch accelerators; nor does the writer deem applicable his remarks concerning workability to cases where vibrators or other special placing processes are rightly employed.

It must be recognized that there is to-day a very definite concrete admixture market, the origin of which is not generally understood even by those who have inadvertently created it. That market has for its authors, not the admixture producer, but that school of thought in engineering that has overemphasized the importance of strength at the expense of workability and all that goes with it—steel bond, impermeability, appearance, and what have you. In naming this school, the writer does not incriminate all who have striven to improve the quality of concrete and who accept compressive strength as an index of quality, nor does he advocate "sluicing" practice. The finger is pointed at those overenthusiastic in that questionable logic that if 2,500-lb. concrete is necessary, 5,000-lb. is twice as good and who, taking great personal pride in big figures, by squeezing the last drop of water out of the mix and unnecessarily raising the fineness modulus of sands, have directly contributed to the formation of a philosophy that excuses some important imperfections in its satisfaction of strength voracity. So persistent is this strength advocate and so unmindful is he of other considerations that we have such a comparison of present and former practice as this:

Year	*Strength*	*Workability*	*Type of Reinforcing Bar*
1912	100%	100%	Round
1932	200%	50%	Deformed

These figures may exaggerate slightly but they illustrate a definite trend. Add to this, if you will, the fact that to-day higher stresses with smaller sections are used and a greater percentage of steel, to say nothing of the thousand-and-one other things, such as conduits, plumbing inserts, drains, and what-not that find their way into members and embarrass placement; and we may answer for ourselves the question: "What brought the admixture?"

The appeal of the admixture is first to the builder, who, in desperation, will "try anything once" in an effort to "get his mud in place" so that it will not look like a coral reef when the forms are stripped. It is frequently not a question of placing costs at all, but a legitimate desire to find a way out of the embarrassing situation he finds himself in.

The foregoing must not be understood as a flat endorsement of all, or even any, admixtures under many conditions. The facts are that there are logical uses for good admixtures and that some admixtures have no excuse for existence other than the salesman's "sucker list." Among users two extremes are found: (1) The man who would rather spend $1 for something in a can with a red label than 50c for Portland cement to do the same thing; and (2) the individual who would not use an admixture under any circumstances. Of course both are wrong. Many architects and engineers are interviewed and pestered and promoted until, in self-defense, they insert in the specifications "Hokus Pokus or equal may be used." Then the promoter comes back and persists until he gets the word "may" changed to "shall"—after all, that's easy to do. Then promoter No. 2, selling "Bogus," appears on the scene

L. A. Perry.

and in due time the architect changes his specifications to read "Hokus Pokus, Bogus, or equal shall be used," and so on. The architect tries to stay modern until it is discovered that the "United Horse Collar and Sleigh Bell Company," which put "Hokus Pokus" on the market, went out of business last year.

Now, if the reader happens to be in a small town over the week-end, or through some other condition of boredom has read this far, the writer purposes to attempt a rough classification of admixtures and to suggest a few rules that may be a safe guide to the specification writer. As a prelude to such a classification, let us remind ourselves that, as some writer so aptly put it, "a mixture is not concrete at all until it is 'in place'; up to that time it's just another material, like the pile of lumber on the back of the lot," and that getting it "in place" requires a degree of manipulation plus a condition of "placeability." All the king's horses and all the king's men can't place a 2-in. slump 1:3:5 in a high, thin wall with double steel and offsets, cut-outs, and inserts and what-not, even if they had smelling salts to keep the mix from getting dizzy; and it's equally true that any fool can pour an 8-in. slump 1:1:2 into a heavy mass footing and make it look good enough to eat.

The first thing the designer should do is recognize a suitable consistency for his job. If it needs a 7-in. slump, he should admit it, and permit it, and demand it. If the 7-in. slump develops a water-cement ratio that is higher than his strength assumption allows, then he has selected the wrong mix, and now is the time to change it, not after the first three floors have been poured. The mix should conform to the necessary consistency, not the consistency to the mix.

IT'S all very well to specify how many tampers shall be used and such things, but let's not try to force performance beyond the realm of practicability. The other day the writer heard the engineer defined as "a man who specifies his head off and then takes just what he gets." Well, we know that accusation is harsh and unjust, but maybe, after all, there is an element of truth in it.

Now here's where admixtures come in. They are supposed to promote workability and undoubtedly all those marketed by responsible producers do, to some extent at least. We also know that additional cement promotes workability. As such, any cement used (beyond the necessities of strength) is an admixture and a good one. Then, when we have recognized the value of both the admixture and the cement as workability media—remembering that they both cost money—we are in a position to make a simple mix comparison on the job and put a finger on ultimate economy. Take, for instance, a base mixture, say a 1:2:4, to which the admixture has been added—let's say diatomaceous earth (18 lb. @ 2c. = 36c.)—and compare the "placeability" of this combination with a similar mixture (1:2:4) to which has been added 0.18 bbl. cement (68 lb. @ $2 per bbl. = 36c.). Now if there is a marked superiority to either one of these mix combinations, why, that's all there is to it; use it! Incidentally, if cement were priced at $3 per bbl. and diatomaceous earth at $15 per ton and the sands lacked superfines, it is a foregone conclusion that the admixture is proper and desirable. If, on the other hand, the cement cost $1 per bbl. and the admixture $40 per ton and the aggregates were of good grading, the admixture would be entirely out of place.

AN incident was recently reported to the writer by the operator of a neighboring central-mixing plant which is thought amusingly illustrative of the effectiveness of a cement admixture. The plant was making a delivery of about 25 cu.yd. of structural 1:2:4 to a customer (alleged to be a prosperous bootlegger investing some of his ill-got gains in a legitimate building venture). The plant, having a batch of 1:2:3 mixed but cancelled, substituted it for the bootlegger's 1:2:4. The operator sent an explanatory message to the bootlegger, who happened to be on the job when the 1:2:3 arrived, and the latter immediately called the plant by 'phone with instructions to make "mistakes" of all the rest of his order. The operator explained the difference in price. The bootlegger replied "Well, who the hell said anything about price? I know my racket and I don't know yours, but I do know that was the most 'agreeable' concrete I ever saw. The boys put it where they wanted it to go without fighting it." Some technologists might well learn from this bootlegger some fundamentals, and it is to be hoped that his sentence (if he should ever be convicted) may be lightened as a reward for his addition of the word "agreeable" to concrete nomenclature.

THERE are three general types of admixtures in common use: powders, emulsions, and liquids. Their popularity, in the writer's field of observation, is thought to be generally in the order named. These are divided in two general groups: mechanical and chemical. Most powders are definitely mechanical admixtures. Emulsions depend chiefly upon mechanical action, though some claim relationship to the chemistry of Portland cement. The majority of liquids are apparently calcium-chloride solutions with some additional mysterious ingredients. As such, any effects noted must be recognized as purely chemical.

The chief, and perhaps sole, function of an admixture is improvement of the workability (or "agreeability") of concrete. It so happens that admixtures sometimes do this by creating a deceptive mixture, in that it may be quite responsive to manipulation and yet appear relatively dry, which pleases the "strength-more-strength" advocate. This deception will be the means of getting a good job in spite of the owner's representative, if he happens to have a warped conception of suitability of consistencies.

It is true that some emulsion admixtures have disclosed the ability to render a mixture reasonably immune from erosion or "washing" when being placed in the presence of ground water. This can

also be accomplished in small volumes by "overmixing" (a practice otherwise improper), and the majority of engineers would probably recommend either dewatering the footing or using tremie practice. There may also be occasional cases under certain climatic conditions where rich mixtures (for workability) should be avoided. In such instances an admixture should be selected, not just "permitted."

It so happens that powdered admixtures ordinarily require more gaging water to achieve a given consistency than will be necessary in the same mix without the admixture and that some, if not all, emulsion admixtures produce given workability with less gaging water than would be used in the same mix without the admixture. These facts might be confusing if one did not remember that in the case of the powdered admixtures, the actual water-cement ratio used is not necessarily the effective ratio, and that in the case of the emulsion admixture, the mechanical workability produced is to a degree a false condition, so that in neither of these cases is one justified in assuming that there is any pronounced effect on strength. The paste content remains essentially the same, which is thought by the writer to be a more truthful index of strength than water-cement ratio.

Any improvement of impermeability by the use of an admixture is thought to be due simply to the improved mechanics of the mixture itself. The writer does not recognize any inherent "waterproofers," and does not think there are any rabbits in the hat, or that storks bring babies.

THE following clauses might well be inserted in any specifications. If followed, the engineer is assured that no harm and possibly much good will result, and he will have the satisfaction of being fair to that much-discussed, sometimes cussed, and little understood industry—admixture production.

1. Chemical admixtures will not be permitted without the sanction of the manufacturers of the cement being used.

2. In no case shall the use of any admixture be justification for adjusting the cement content of the mixture.

3. In no case shall the use of an admixture justify the setting up of a differential in the water-cement ratio.

4. Admixtures which cause a perceptible bulking of the concrete shall not be permitted.

5. Powdered admixtures shall not be used in quantities exceeding 3 per cent. by weight of the cement content of the mixture.

6. Emulsion admixtures shall not be used in quantities exceeding 1½ lb. per cu. yd. of concrete.

7. Before the use of any admixture is permitted, the producer thereof shall submit to the engineer a sample of the proposed material with a statement of its trade name, its physical properties and chemical analysis, and a description of a method of test to determine uniformity.

TOWARD the young man leaving college with a sheepskin and an ambition to make a fortune in the concrete-admixture business—and marry the girl in his home town—the writer entertains kindly feelings. If pressed to do so, he might even give the chap some advice such as the following:

1. Upon registering at your hotel in a strange town, examine the register carefully. If more than 66⅔ per cent. of the guests are admixture men, take the next train back; there is a saturation point in admixtures as in automobiles and alcoholic stimulants.

2. If you must sell an admixture, try to find one that has some excuse for existence, and is in practical form for proportioning small or large batches.

3. Don't try to tell people that your stuff will make a 1:7:11 mix flow uphill; it won't.

4. Don't use a Grade "A" material for promotional purposes and then fill the order with Grade "B"; we get wise after awhile.

5. Don't make any "cracks" about your stuff "bulking" concrete; it probably isn't so, and if it were, well-informed engineers would kick you out.

6. State clearly the composition of your admixture. If, for instance, sawdust and skim milk form the active elements, this information should appear on the artistic label on the can. A trade name could also be used. The initials G. Y. P. would be effective. Customers would soon learn to omit the punctuation. If the sales volume is disappointing, the price should be raised to $4.09 per gal. The 9c. sounds good and the $4 is easy to remember.

7. Write your congressman asking him to oppose any further naval reductions because, with each vessel decommissioned, its personnel, otherwise unemployed, might become admixture salesmen and make the "game" just so much tougher; it's plenty tough now!

Startling New Theory Developed on Mechanism of Lubrication

(Continued from page 33)

Incidentally, tests on the new machine have given a basis for serious intimation that lubricants (many if not all) consist of two parts: one performing the functions of the lubricant and the other acting as a colloidal solvent thereto. If viscosity has any bearing on the lubricating properties of the oil, it is only the viscosity of the lubricating constituents of the lubricant and not the diluent constituent.

Because of the speeds and loads now used in machinery, the difficulty of the problem of lubrication has increased tremendously as compared with even the recent past. So many lubricants are offered nowadays and so great is the responsibility of the engineer who is to make a selection from them that rapid and reliable methods of testing become exceptionally important, as well as a clear conception of the mechanism of lubrication. The paper was prepared by W. F. Parish, chairman of the committee, formerly chief of the Lubrication Department, Air Service, War Department, and Leon Cammen, consulting engineer.

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is selected without significance as to current events or the position of the individual in the industry.

OTTO KUEHNE, JR.
President and General Manager
Kansas Sand Co.,
Topeka, Kan.

Personal Mention

L. R. Witty, manager of the Wabash Sand & Gravel Co. of Terre Haute, Ind., has resigned his position after 25 years in the service of the company. Mr. Witty resigned because of ill health and expects to enter a hospital at Rochester, Minn., shortly. **Louis F. Hart,** who has been connected with the company for the last 14 years, has been appointed his successor. Mr. Hart joined the concern after his return from France where he served in the Eighty-fourth Division.

Cloyd M. Chapman, consulting engineer of New York, N. Y., and chairman of Committee C-9 on "Concrete and Concrete Aggregates" of the American Society for Testing Materials, was elected president of the Society at its annual meeting, which closed June 24 at Atlantic City. **W. H. Bassett** of the American Brass Co., Waterbury, Conn., was named vice-president.

S. F. Beatty, who is well known for his activities as president of the Austin-Western Road Machinery Co. and of the Road Machinery Manufacturers' Assn., as well as through his many years of service as officer and director of the American Road Builders' Assn., has been elected president of the Austin Manufacturing Co., of Chicago.

W. T. Beatty, for many years president and general manager of the Austin Manufacturing Co., has been elected chairman of the board, while **K. N. Forbes** has been elected vice president.

Paul Mori, superintendent of the Amherst, O., quarry and plant of the Cleveland Quarries Co., has been elected president of the Lorain County Federation of Evangelical Churches.

H. V. Schiefer, formerly with the R. H. Beaumont Co., is now associated with the C. O. Bartlett & Snow Co. of Cleveland, O., in connection with the sale of fuel and ash-handling equipment and bulk-material-handling systems. Mr. Schiefer is making his headquarters at the company's main offices in Cleveland.

Floyd Carpenter has been named superintendent of production of the Adrian Concrete Products Co., of Adrian, Mich. **C. W. Addington** has been appointed manager of the building-materials department. The company was recently reorganized and has moved into new quarters.

F. O. Wyse, advertising manager of the Bucyrus-Erie Co., has again been chosen president of the Milwaukee Assn. of Industrial Advertisers. **L. P. Niessen** of Cutler-Hammer, Inc., was elected vice-president.

Henry J. Kaiser, of Oakland, Cal., has been appointed president of the Associated General Contractors of America to fill the vacancy created by the death of Col. William A. Starrett. Mr. Kaiser is vice-president of Six Companies, Inc., contractor for the $49,000,000 Hoover dam now under construction on the Colorado River at Boulder Canyon. He is also president of the Kaiser Paving Co., an important aggregates producer in the San Francisco area.

Henry J. Kaiser.

Louis Engelage and **William Thiemann,** employees of the quarry of the Klondike Sand Co. at St. Charles, Mo., were injured recently when a portion of the ceiling in a tunnel gave way.

Joseph Popp, an employee in the Hudson, N. Y., plant of the Universal Atlas Cement Co., was recently awarded $1,305 compensation for injuries suffered some time ago in the mill. Mr. Popp has partially lost the use of one leg.

J. H. Cadwell, who for some time was connected with the former Caterpillar dealer in northern Ohio, will handle Caterpillar sales for the W. T. Walsh Equipment Co., Cleveland, O., the company having been appointed sales and service representative in that area by the Caterpillar Tractor Co.

Dr. W. H. Collins, director of the Geological Survey of Canada, an authority on Pre-Cambrian geology, has been elected a member of the American Philosophical Society.

Dr. C. K. Leith has been nominated for the presidency of the Geological Society of America for 1933.

Obituary

R. D. Mahaffey, vice-president and treasurer of The American Well Works, passed away June 3 after an illness of several months. He was born November 2, 1866 at Hinckley, Ill., being 65 years old at the time of his death. Mr. Mahaffey had been identified with The American Well Works and the pump industry for a period of 43 years, having started with the company as office boy and by hard work and energy, attained the position of treasurer and later vice-president. He was a past president of the Hydraulic Society, vice-president of the Home Building & Loan Assn. of Aurora, Ill., director of the Chamber of Commerce and was a charter member of the Union League Club.

Levi F. Carson, superintendent of the Clingen quarry of the John T. Dyer Quarry Co. of Norristown, Pa., died June 9. Mr. Carson had been employed by the Dyer company for 38 years.

Willis Leriche, vice-president of the Cement Gun Co., a subsidiary of Traylor Engineering & Manufacturing Co., Allentown, Pa., met his death June 5 when his airplane crashed near Allentown. Mr. Leriche was president of the Allentown Aviation Corp. and had gone up in a trial flight preceding an air meet sponsored by the Allentown Flying Club when his ship went into a nose dive. A passenger was critically injured.

W. T. Collins, 52 years old, for many years superintendent of the Hillside, Ill., crushed-stone plant and quarry of the old James & A. C. Laughlin Co., now out of existence, died at his home in Forest Park, Ill., recently. He was a native of LaSalle, Ill.

Coming Events

July 6-9, 1932. Yellowstone National Park. Annual convention, American Society of Civil Engineers.

July 14, 1932. St. Louis, Mo. Monthly meeting, St. Louis Quarrymen's Assn., Forest Park Hotel. E. J. McMahon, exec. sec., 4063 Forest Park Blvd., St. Louis, Mo.

July 18-23, 1932. Amsterdam, Holland. Fifth International Congress for Scientific Management. Dr. L. M. Gilbreth, Montclair, N. J., official United States representative of International Management Congress Committee.

October 3-7, 1932. Washington, D. C. Twenty-first Annual Safety Congress, National Safety Council. W. H. Cameron, secretary, 20 N. Wacker Drive, Chicago, Ill.

Traffic News and Comment

Recent I. C. C. Decisions

Crushed Stone and Ground Limestone.—Rates on crushed stone and crushed stone screenings from Rocky Point, Va., to destinations in the Carolinas unreasonable and has awarded reparation. Reasonable maximum rates prescribed will not exceed the rates prescribed for like distances in I. C. C. Docket No. 17,517, rates on chert, clay, sand and gravel, 122 I. C. C. 133; 140 I. C. C. 85; 160 I. C. C. 309; and 172 I. C. C. 219, distances to be computed over the rate making routes, but in no case shall the rate exceed by more than 20 c. a net ton the rate that would be made by applying the scale over the shortest route over which the traffic could move without transfer of lading. An arbitrary of 25 c. a net ton was prescribed to be added on shipments in connection with the Aberdeen & Rockfish, the Atlantic & Yadkin, the Norfolk Southern and the Wilmington, Brunswick & Southern, to accrue solely to them.

Rates on ground or pulverized limestone used as a highway filler were found applicable on certain shipments covered by the complaint.

Stone-dust rates from Rocky Point to certain destinations were found unreasonable and reparation was awarded. Reasonable rates prescribed will not exceed rates prescribed for like distances in I. C. C. Docket No. 22,771, Falling Spring Lime Co. *v.* C. & O., 172 I. C. C. 783, rates on ground limestone from Barber, Va., to the south, subject to the same c.l. min. wt., distances to be computed over the shortest routes over which traffic can move without transfer of lading. The 25 c. arbitrary allowed on crushed stone was also allowed on stone-dust. New rates are to be made effective not later than August 31, 1932. I. C. C. Docket No. 22,315, Liberty Lime & Stone Co., Inc. *v.* A. & R. *et al.*

Talc.—The Commission has found the rates on talc from Gouverneur, Hailesboro, Emeryville, Talcville and Natural Bridge, N. Y., to Sheldon Springs, Vt., unreasonable to the extent they exceeded or may exceed 16 c., plus charges authorized in the Fifteen Per Cent. Case, 1931, and has awarded reparation. I. C. C. Docket No. 24,435, Missisquoi Pulp & Paper Co. *et al v.* N. Y. C. *et al.* (PIT AND QUARRY July 1, 1931, p. 80; and Feb. 10, 1932, p. 74).

Examiners' Reports

Lime.—Examiner C. A. Rice on further hearing recommends that the Commission modify their former findings in 159 I. C. C. 9, in which they found the rates on lime from Woodville, Ohio, to destinations on the Maryland and Pennsylvania were not unreasonable in the past but for the future would be unreasonable, by finding that two shipments from Woodville to Bel Air, Md., were misrouted by the Pennsylvania and award reparation of $24.00 on the basis of the applicable rate being 35½ c. per 100 lb. I. C. C. Docket No. 20,246, Washington Building Lime Co. *v.* Pennsylvania *et al.*

New Complaints Filed

Barytes.—Unreasonable rates on ground barytes (sulphate of barium), not precipitated, from Los Angeles, Cal., to Hobbs, N. M., are alleged, and a rate of 55 c. and reparation sought in I. C. C. Docket No. 25,313, Humble Oil & Refining Co., Houston, Tex. *v.* A. T. & S. F. *et al.*

Talc.—New rates and reparation are sought on shipments of talc from Natural Bridge and Emeryville, N. Y., to Richmond, Va., on an allegation of violation of section 1, in I. C. C. Docket No. 25,302, Standard Paper Mfg. Co., Inc., Richmond, Va. *v.* B. & O. *et al.*

Alleging unreasonable rates on talc from Emeryville, N. Y., to Milwaukee, Wis., and Newark, N. J., new rates and reparation are prayed for in I. C. C. Docket No. 25,307.

Amiesite.—Reparation is sought on shipment of ground or broken stone to which asphalt was added, from Big Clifty, Ky., to points in Michigan and Pennsylvania, under violation of section 1, in I. C. C. Docket No. 25,306, The Crown Rock Co., Cincinnati, O. *v.* B. & O. *et al.*

Rate-Committee Dockets

New England Freight Assn.

Cement.—Shippers propose the establishment of the same rates on cement in bulk, c.l. min. wt. 50,000 lb., that now apply on cement in bags or in barrels, from Rockland, Me., to points on the N. Y. N. H. & H. Docket No. 25,533.

Sand.—Carriers propose to reduce the rate on common sand, c.l. min. wt. 30 net tons, from E. Swanton, Vt., to St. Johns, P. Q., from 70 c. to 60 c. per net ton. Docket No. 25,483.

Trunk Line Assn.

Gravel.—Shippers propose the establishment of a rate of 60 c. per net ton on gravel, c l. min. wt. 50,000 lb., from Port Norfolk, Va., to Tasley to Cape Charles, Va., inclusive. This rate is to apply on material for building or improvement of public roads or streets and for the benefit of the public, not to apply when consigned to contractors or other parties than public officials.

Lime and Ground Limestone.—Carriers propose to amend Trunk Line tariffs publishing rates on lime and unburnt ground or pulverized limestone, c.l., from all Trunk Line producing points to the extent of publishing therein the following rule: "Mixed carloads of building lime and/ or agricultural chemical, and land lime and/ or unburnt, ground, or pulverized limestone will be charged at actual weight and at the applicable rate for each of the respective commodities, subject to the min. wt. of 50,000 lb., for each mixed carload, deficit in the min. wt. if any, to be paid for at the rate applicable on the highest rated article in the mixture." Docket No. 29,300 Sup. 1.

Central Freight Assn.

Cement.—Shippers propose the establishment of a rate of 11 c. per 100 lb., on cement, c.l. min. wt. 50,000 lb., from Osborn, O., to Marion, Ind., for Indiana R. R. delivery. Docket No. 31,675.

Shippers at Chicago, Ill., propose the establishment of rates on cement c.l. min. wt. 50,000 lb., to points in C. F. A. territory on the basis of the scale prescribed in I. C. C. Docket No. 12,710. Representative rates are, to Toledo, O., 13½ c.; to South Bend, Ind., 9½ c.; to Cleveland, O., 15½ c.; to Buffalo, N. Y., 19 c. Class rates now apply. Docket No. 31,755.

Crushed Stone.—The establishment of a rate of 80 c. per net ton on crushed stone in open top cars from Ingalls, Ind., to Elwood, Ind., is proposed by shippers. Docket No. 31,672.

Carriers propose to publish a rate of $1.00 per ton on crushed stone from Putnamville, Ind., to Shadeland and West Point, Ind. Docket No. 31,694.

Shippers at Ashtabula and Ashtabula Harbor, O., propose the establishment of the following rates on crushed stone and related articles: to Perry, Conneaut, Leon, O., 60 c.; Painesville, O., Swanville, Pa., Williamsfield, Wick, O., 70 c.; Andover and Mann, O., 65 c. per net ton. Docket No. 31,762.

Carriers propose to publish a rate on crushed stone from Carey, O., to Lamira and Flushing, O., of $1.35 per net ton. Docket No. 31,770.

Amiesite.—Shippers propose the establishment of a rate of $2.34 per ton on crushed stone, coated with oil, tar or asphaltum, from Chicago, Ill., to Detroit, Mich. Docket No. 31,731.

Dolomite.—Shippers propose the establishment of a rate of $2.80 per net ton on raw or crude dolomite and fluxing stone, from Genoa, Martin and Marblehead, O., to McBeth, W. Va. Docket No. 31,685.

Sand.—Shippers at East Liverpool, O., propose the establishment of the following rates on industrial sands: to Detroit, Mich., $1.89; Indianapolis,

Ind., $2.39; Louisville, Ky., $2.90 per net ton. The sixth class rate now applies. Docket No. 31,763.

Sand and Gravel.—Carriers propose to publish a rate on filter sand and filter gravel from Chicago, Ill., to Ft. Wayne, Ind., of $1.51 per net ton. Docket No. 31,684.

Slag.—Shippers at Hamilton, O., are asking for a rate of 90 c. per ton on slag to Rushville, Ind. Class rate now applies. Docket No. 31,688.

Illinois Freight Assn.

Agricultural Limestone.—On agricultural limestone, c.l. min. wt. 60,000 lb., it is proposed to establish rates to destinations in I. F. A. territory on the same basis as now applies from Chicago, Bellwood, McCook, La-Grange, Ill., and grouped points. At present rates are on the crushed stone basis. Docket No. 6,639.

At present agricultural limestone in barrels and boxes, or in bulk in bags, barrels and boxes, less than carload, between points in I. F. A. territory moves on rates 50 per cent of first class. It is proposed to change this basis to 30 per cent of first class. Docket No. 6,662.

Crushed Stone.—Increases in the rates on crushed stone and related articles in open-top cars,[1] from Lehigh, Van Siding and West Kankakee, Ill., are proposed as follows in Docket No. 3,559-B:

To	Present	Proposed
Gardner, Ill.	$0.60	$0.76
Coster, Ill.	.60	.70
Essex, Ill.	.60	.70
Bonfield, Ill.	.60	.70

Sand.—It is proposed to establish a rate of $1.40 per ton on moulding sand, c.l. min. wt. marked capacity of car, from Bowes, Ill., to Ottawa, Ill. Docket No. 4,956 Sub. 7.

Sand and Gravel.—A commodity rate of 88c per net ton on sand and gravel,[1] from Buckhart, Ill., to Andrew and Cantrall, Ill., is proposed. The class rate now applies. Docket No. 6,642.

A reduction in the rate on sand and gravel,[2] from Pit No. 5 (Crescent, Ill.), to Peoria, Ill., from 51 c. plus emergency charge, to 41 c. plus emergency charge, is proposed. Docket No. 6,659.

It is proposed to establish the commodity rates shown below on sand and gravel,[1] from Magner, Ill., to stations on the Alton R.R. Classification basis now applies. Docket No. 6,660.

To	Proposed
Delavan, Ill.	$1.26
Petersburg, Ill.	1.13
Lincoln, Ill.	1.13
Griggs, Ill.	1.26
Thayer, Ill.	1.13
Hagaman, Ill.	1.26
Kahn, Ill.	1.40

A reduction in the rate on sand and gravel,[2] from Chillicothe, Ill., to Edelstein, Ill., from 80 c. plus 6 c. emergency charge to 45 c. plus 4½ c. emergency charge, is proposed. Docket No. 3,330-P.

[1] The c.l. min. wt. will be 90 per cent. of the marked capacity of car, except when car is loaded to full cubical or visible capacity, actual weight will apply.

[2] The c.l. min. wt. will be the marked capacity of car, except when car is loaded to full cubical or visible capacity, actual weight will apply.

Western Trunk Line Committee

Cement, Lime and Plaster.—It is proposed to change the rules governing mixed carload shipments of cement, lime and plaster by cancelling Rule 105-B, Supplement 26 to W. T. L. Tariff 133-G, and substituting the following rule: On shipments from Des Moines, Linwood, Ia., Louisville, Neb., Mason City, Ia., Rapid City, S. D., Superior, Neb., and Valley Jct., Ia., to destinations in Nebraska and South Dakota, as named herein, mixed carload shipments of cement, lime and/or plaster, charges will be assessed as follows: Apply on the cement, the carload cement rate at actual weight, but not less than 50,000 lb., and on the lime, plaster and/or stucco, actual weight, a rate of 3 c. per 100 lb. higher than the rate charged on the cement. Exception No. 1. Above rule will not apply via M. St. P. & S. S. M. Ry., to points west of St. Paul or Duluth, Minn., nor via Gt. Nor. or Nor. Pac. Docket No. 5,645-C.

Mica.—Shippers propose a reduction in the rate on mica from 38½ c. per 100 lb., on a c.l. min. wt. of 40,000 lb., to 28 c. on a c.l. min. wt. of 60,000 lb., from Custer and Keystone, S. D., to Chicago and Forest Park, Ill. Docket No. 8,001.

Southern Freight Assn.

Agricultural Limestone.—It is proposed to establish rates on ground or pulverized agricultural limestone from Dugan, Ky., to Fordsville, Henderson, Ky., and Evansville, Ind., the same as currently in effect from Nicholson, Ky. It is proposed to make no change in the rate of 70 c. on agricultural limestone in open top cars from Dugan to Fordsville. Docket No. 58,049.

Crushed Stone, Sand and Gravel.—Carriers propose to eliminate the arbitrary of 25 c. per ton on crushed stone, sand, gravel and chert, for the account of the Warrenton, R. R. Co., as published in Cottrell's I. C. C. 767. Docket No. 58,030.

Sand and Gravel.—It is proposed to establish through rates on sand and gravel from Bostic and Forest City, N. C., to Clinch Valley Division N. & W. stations, ranging from $1.80 to $2.00 per net ton. Complete statement will be furnished on request. Docket No. 58,003.

Sand and Tripoli.—Shippers propose a reduction in the rate on silica (silex), tripoli and silica sand, powdered or pulverized, from Burnsville, N. C., to Knoxville, Tenn., from $3.60 to $3.30 per net ton. Docket No. 58,004.

Southwestern Freight Bureau

Cement.—Carriers propose to amend the method of arriving at rates on cement published in S. W. L. Tariffs 128-E and 150-D, to be assessed at points adjacent to state lines, where each state is covered by separate I. C. C. order (and on the same scale), as follows: To Texas destinations; instead of figuring the rate making mileage from first station in Texas in arriving at a base point, continue your mileage in the state of Oklahoma from the last common or junction point, when same would make the mileage as prescribed under the formula. This is to comply with F. S. O. No. 9,544, wherein Docket No. 15,151 scale was prescribed as maxima to intermediate points. Docket No. 24,885.

Crushed Stone, Sand and Gravel.—Shippers propose the addition of a new section to Item 160, S. W. L. Tariff 162-D, making the rates on crushed stone, sand and gravel, 4 c. per net ton higher than the rates from Holliday, Kan., determined in accordance with section 5 of the item, and only to apply when routed via Kansas City, Mo. Docket No. 24,896.

Pumicite.—It is proposed to establish a uniform basis of 12 per cent. of first class on pumicite (volcanic ash) c.l. min. wt. 60,000 lb., between all points covered by S. W. L. Tariffs 151, 152-A and 154-B. The 17½-per cent. basis now applies on most of the traffic. Docket No. A-764.

First Concrete Street Paved Forty Years Ago

This year marks the fortieth anniversary of the oldest concrete pavement in the United States.

In 1892, before there were any automobiles, Bellefontaine, O., installed strips of concrete on Opera and Court streets on two sides of its courthouse. Streets on the two remaining sides of the courthouse were paved the following year. This old pavement is still giving excellent service.

The application of concrete as a street paving material came about by accident, reports W. T. G. Snyder, who as a sidewalk contractor was called upon to build the first concrete pavement. City officials of Bellefontaine had experienced difficulty in obtaining a satisfactory pavement for the hitching-rack areas around the courthouse, for the large Percheron horses driven to town by the farmers made short work of the materials then available. Upon learning that Mr. Snyder had installed a successful concrete surface for a crossing driveway for a lumber company, the city asked him to concrete the streets.

Bellefontaine continued to pave streets with concrete and its use spread rapidly throughout the country. Today there are 24,000 miles, on the basis of a 30-ft. width, in the United States. In addition there are in excess of 90,000 miles of concrete rural roads.

Michigan Gravel Assn. in Meeting at Lansing

Members of the Michigan Sand & Gravel Producers' Assn., held a regular meeting on June 14 at the Olds Hotel at Lansing, Mich. Routine business was discussed.

Latest Portland-Cement Statistics

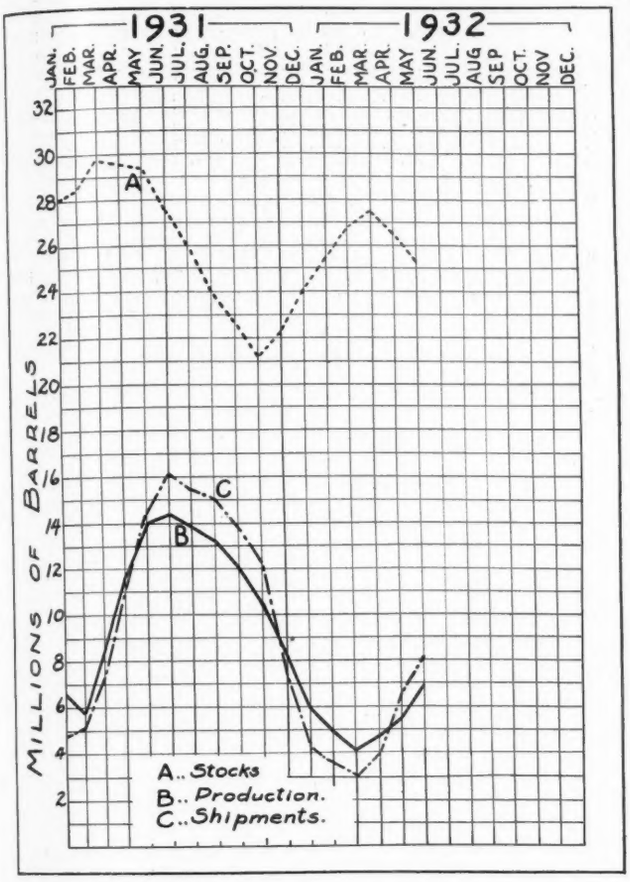

1931
1932
JAN. FEB. MAR. APR. MAY JUN. JUL. AUG. SEP. OCT. NOV. DEC.
JAN. FEB. MAR. APR. MAY JUN. JUL. AUG SEP OCT. NOV DEC.
MILLIONS OF BARRELS
32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2
A
B
C
A.. Stocks
B.. Production.
C.. Shipments.

Chart showing monthly production, shipments and stocks on hand at end of month, from January, 1931, to May, 1932.

THE Portland-cement industry in May, 1932, produced 6,917,000 bbl., shipped 8,048,000 bbl. from the mills, and had in stock at the end of the month 25,365,000 bbl. Production in May, 1932, showed a decrease of 50.6 per cent. and shipments a decrease of 43.3 per cent. as compared with May, 1931. Portland-cement stocks at the mills were 14 2 per cent. lower than a year ago.

In the statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of May, 1932, and of May, 1931. The estimates include increased capacity due to extensions and improvements during the period.

DISTRIBUTION OF CEMENT

Shipped to—	March		April	
	1931	1932	1931	1932
Alabama	175,601	35,482	219,593	44,565
Alaska	1,111	132	1,153	524
Arizona	53,821	20,293	47,083	15,893
Arkansas	74,768	12,353	183,121	14,534
California	691,790	487,421	653,624	455,498
Colorado	42,724	26,601	70,204	61,974
Connecticut	82,833	42,557	150,380	94,490
Delaware	14,473	10,545	32,856	28,895
District of Columbia	76,232	68,265	119,153	97,351
Florida	49,466	31,427	61,526	39,674
Georgia	151,326	99,498	182,817	82,155
Hawaii	24,602	12,565	20,849	29,953
Idaho	16,408	10,944	21,558	12,480
Illinois	279,580	118,689	717,468	335,544
Indiana	130,801	69,500	256,697	157,969
Iowa	121,769	46,383	309,768	145,776
Kansas	133,354	55,666	184,369	126,952
Kentucky	97,970	54,024	197,013	90,728
Louisiana	216,170	72,511	277,366	58,675
Maine	19,556	6,550	36,091	26,384
Maryland	103,592	59,289	181,752	140,479
Massachusetts	151,893	94,976	279,032	209,812
Michigan	200,479	93,462	395,559	179,013
Minnesota	106,842	60,441	268,765	164,514
Mississippi	29,594	27,989	53,159	25,123
Missouri	221,789	115,809	406,831	250,745
Montana	19,072	8,164	24,187	18,034
Nebraska	58,027	35,266	131,416	68,633
Nevada	9,804	24,762	11,722	36,163
New Hampshire	11,868	7,340	30,884	23,710
New Jersey	285,359	135,539	484,331	297,700
New Mexico	23,879	19,237	30,751	24,577
New York	1,035,782	584,409	1,527,913	970,867
North Carolina	92,639	41,032	123,303	55,225
North Dakota	17,176	4,413	35,616	19,740
Ohio	308,587	166,664	491,647	310,376
Oklahoma	136,628	95,017	244,250	123,596
Oregon	84,549	56,798	105,653	71,357
Pennsylvania	458,913	227,854	697,081	427,501
Porto Rico	2,672	4,575	2,825	5,645
Rhode Island	52,935	14,861	73,310	31,523
South Carolina	214,460	56,714	234,756	55,309
South Dakota	28,631	11,565	56,775	27,070
Tennessee	91,664	53,689	151,183	98,855
Texas	428,923	384,174	524,419	403,806
Utah	28,086	10,972	31,633	15,997
Vermont	7,389	2,379	22,391	15,312
Virginia	118,992	64,153	162,050	86,856
Washington	174,642	83,502	211,323	163,168
West Virginia	70,953	44,309	92,214	65,620
Wisconsin	119,628	64,183	288,648	176,417
Wyoming	8,585	3,579	13,920	7,547
Unspecified	16,547	8,858	19,876	24,551
	7,147,934	3,947,380	11,151,864	6,514,855
Foreign countries	44,066	25,620	32,136	21,145
Total shipped from cement plants	7,192,000	3,973 000	11,184,000	6,536,000

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN APRIL, 1932

Exported to—	Barrels	Value
Canada	885	$ 4,320
Central America	12,882	19,536
Cuba	1,000	1,776
Other West Indies	1,094	2,156
Mexico	3,575	11,852
South America	9,306	23,577
Other countries	1,381	6,234
	30,123	69,451

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN APRIL, 1932

Imported from—	District into which imported	Barrels	Value
Canada	Maine and New Hampshire	8	$ 24
Denmark	Porto Rico	13,133	10,408
Japan	Hawaii	1,575	1,035
Spain	Porto Rico	6	19
United Kingdom	New York	44,670	30,001
	Total	59,392	$41,487

RELATION OF PRODUCTION TO CAPACITY

	May		April	March	February
	1931 (*per cent.*)	1932 (*per cent.*)	1932 (*per cent.*)	1932 (*per cent.*)	1932 (*per cent.*)
The month	62.8	30.2	24.8	21.3	18.7
The 12 months ended	56.5	38.9	41.7	43.8	45.2

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1931 AND 1932 (*thousands of barrels*)

Month	Production		Shipments		Stocks at End of Month	
	1931	1932	1931	1932	1931	1932
January	6,595	5,026	4,692	3,393	27,759	25,778
February	5,920	3,971	5,074	3,118	28,612	26,657
March	8,245	4,847	7,192	3,973	29,676	27,545
April	11,245	5,478	11,184	6,536	29,715	26,496
May	14,010	6,917	14,200	8,048	29,554	25,355
June	14,118	.....	16,077	.....	27,602	.....
July	13,899	.....	15,545	.....	25,934	.....
August	13,549	.....	15,172	.....	24,313	.....
September	12,092	.....	13,671	.....	22,736	.....
October	10,762	.....	12,360	.....	21,218	.....
November	8,161	.....	7,156	.....	22,219	.....
December	5,974	.....	4,142	.....	24,098	.....
Totals	124,570	.....	126,465	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER, BY DISTRICTS, in MAY, 1931 and 1932 (*thousands of barrels*)

District	Production		Stocks at end of Month	
	1931	1932	1931	1932
Eastern Pa., N. J., and Md.	3,004	1,149	1,923	985
New York and Maine	1,028	551	1,403	950
Ohio, Western Pa., and W. Va.	1,188	404	1,634	1,006
Michigan	577	618	1,679	1,231
Wis., Ill., Ind., and Ky.	1,685	644	1,706	1,323
Va., Tenn., Ala., Ga., Fla., and La.	1,283	562	737	575
Eastern Mo., Ia., Minn., and S. Dak.	1,318	903	1,027	701
W. Mo., Neb., Kan., Okla., and Ark.	1,125	469	732	822
Texas	496	248	193	335
Colo., Mont., Utah, Wyo., and Idaho.	312	101	280	130
California	800	463	1,362	1,636
Oreg. and Wash.	343	204	411	262
Totals	13,159	6,316	13,087	9,956

PRODUCTION, SHIPMENTS, AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN MAY, 1931 AND 1932, AND STOCKS IN APRIL, 1932 (*thousands of barrels*)

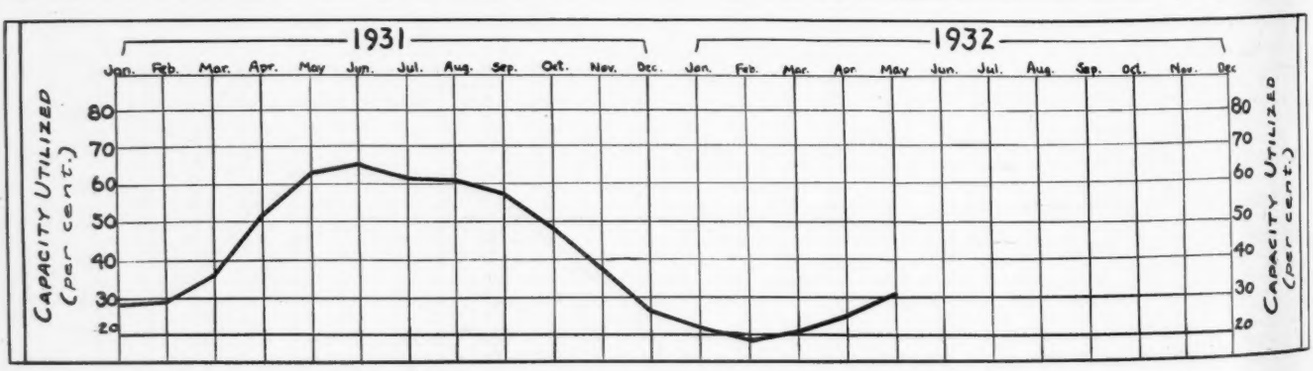
District	May						Stocks at End of April 1932
	Production		Shipments		Stocks at End of Month		
	1931	1932	1931	1932	1931	1932	
Eastern Pa., N. J., and Md.	3,053	1,334	2,952	1,840	6,824	5,508	6,014
New York and Maine	1,106	610	1,137	742	2,044	1,792	1,924
Ohio, Western Pa., and W. Va.	1,289	471	1,252	642	3,513	3,018	3,190
Michigan	722	586	825	416	2,482	2,215	2,045
Wis., Ill., Ind., and Ky.	1,913	821	1,743	1,032	4,378	3,561	3,772
Va., Tenn., Ala., Ga., Fla., and La.	1,418	718	1,428	509	1,630	1,759	1,549
Eastern Mo., Ia., Minn., and S. Dak.	1,335	822	1,538	1,023	3,862	3,435	3,636
W. Mo., Neb., Kan., Okla., and Ark.	1,248	476	1,307	616	1,826	1,344	1,484
Texas	600	208	644	323	734	685	800
Colo., Mont., Utah, Wyo., and Idaho.	296	105	298	123	609	381	398
California	703	542	710	538	1,103	1,076	1,072
Oreg. and Wash.	327	224	366	244	549	591	612
Totals	14,010	6,917	14,200	8,048	29,554	25,365	26,496

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1931 AND 1932

Month	Exports				Imports			
	1931		1932		1931		1932	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	41,199	$115,678	36,704	$82,984	95,609	$120,298	14,375	$16,648
February	25,703	88,989	12,889	39,350	21,984	25,391	83,706	69,197
March	54,599	144,579	39,105	81,856	70,378	80,360	19,173	17,215
April	40,478	116,564	30,123	69,451	53,333	58,576	59,392	41,487
May	48,028	140,953	.....	.....	19,325	20,568	.....	.....
June	43,597	107,610	.....	.....	32,079	42,955	.....	.....
July	29,344	97,837	.....	.....	14,332	15,582	.....	.....
August	39,517	106,643	.....	.....	8,895	11,739	.....	.....
September	27,570	81,399	.....	.....	33,574	33,520	.....	.....
October	24,531	68,524	.....	.....	39,642	42,380	.....	.....
November	33,200	97,796	.....	.....	27,940	22,235	.....	.....
December	21,887	54,028	.....	.....	40,147	34,314	.....	.....
Totals	429,653	1,220,600	.....	.....	457,238	507,918	.....	.....

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1931 AND 1932 (*thousands of barrels*)

Month	Production		Stocks End of Month		Month	Production		Stocks End of Month	
	1931	1932	1931	1932		1931	1932	1931	1932
January	8,129	6,107	10,384	8,184	July	12,246	.....	10,209	.....
February	7,473	5,176	11,946	9,375	August	11,664	.....	8,468	.....
March	9,586	5,443	13,318	10,025	September	10,414	.....	6,918	.....
April	11,540	5,924	13,854	10,511	October	9,825	.....	6,021	.....
May	13,159	6,316	13,087	9,956	November	8,259	.....	6,215	.....
June	12,679	.....	11,837	.....	December	6,840	.....	7,035	.....



Production capacity utilized by months, January, 1931, to May, 1932.

Review of Foreign Practice

Investigation Indicates "Brownmillerite" Exists

In an investigation suggested by Prof. Kühl and carried on with the collaboration of the Cement Technology Institute of the Berlin Technological College and the Kaiser Wilhelm Institute for Silicate Research, the author establishes by chemical and X-ray methods the existence of the ternary compound known as "Brownmillerite," 4 $CaO.Al_2O_3.Fe_2O_3$. This compound is stable even with an excess of lime, the surplus lime remaining uncombined; there is no separation into tricalciumaluminate and dicalciumferrite or into a mixed crystal of dicalciumferrite and Brownmillerite. Analogy of structures, calculated with the help of the molecular volumes, verifies the isomorphy, recognized by Brownmiller, between Brownmillerite and dicalciumferrite and the possibility of the formation of mixed crystals.—Dipl.-Ing. Serban Solacolu in *Zement* 21:301-305, May 26, 1932.

Limits to Using Gypsum In Lime-Pozzuolana Mix

It has been recognized for some time that gypsum improves the strength of lime-pozzuolana mixtures, but the gypsum must be added in proportions scientifically determined in relation to the activity of the pozzuolana, the mixing ratio of lime and pozzuolana, and the granular state of the materials in question. The author reports the preliminary results of tests to determine the limits within which gypsum is beneficial. The tests were conducted on Roman pozzuolana from San Sebastiano, free from clay or organic impurities, ground and screened through the 4,900-mesh/sq. cm. screen; the other materials were powdered hydrated lime and pure gypsum. Specimens from mixes of varying proportions were stored in naturally-moist air for 7 days, then in water at 15 to 18 deg. C. until they were removed for breaking. The table shows the crushing strength in k.g. per sq. cm. of the specimens at periods of 1 and 3 mo.

These results uniformly show an increase of strength with 5 per cent. of gypsum. In the mortars made with 10 per cent. of gypsum the specimens in the 1:1 and 1:2 mixes even after 1 mo. time clearly showed an increase in volume and disintegration.—Fernando Parissi in *Le Industrie del Cemento* (Milan) 29:32, April, 1932.

Gypsum (per cent.)		Proportions by Weight of Slaked Lime and Pozzuolana			
		1:1	1:2	1:3	1:4
1 month	0	46.4	65.0	85.9	105
	5	56.7	74.8	93.0	121
	10	9.2	41.0	82.0	80
	15	not testable	in progress	in progress	in progress
3 months	0	65.7	111.0	127.0	134
	5	88.5	111.0	129.0	151
	10	45.0	72.0	in progress	in progress
	15	in progress	in progress	in progress	in progress

Propose Specifications for Fine Types of Sand

In spite of the attention that has been paid to the requirements for sand as concrete aggregate there are in Germany no clear or definitive specifications determining the quality of sands used for masonry or for plastering. Neither the trade nor the scientific publications have any requirements beyond generalities such as that the sand shall be as free as possible from soluble organic materials, shall consist of particles as angular and sharp as possible and with the roughest possible surface, and that the sand shall have the smallest possible volume of voids.

To develop more rational data on this question the German Association of Sand and Gravel Works had nineteen specimens of sand collected from different parts of Germany and had them studied in relation to their suitability for masons' and plaster sands. A tabulation of the results shows that the weight per liter varied from 1.30 to 1.69 kg. loose and from 1.69 to 1.80 after shaking. The specific gravities varied from 2.60 to 2.67 and the "degree or density" (weight after shaking in relation to specific gravity) from 0.64 to 0.74. The content of soluble organic materials lay for the most part between 0 and 0.6 per cent; in three cases it was greater than 2 per cent (2.9, 3.3 and 5.6 per cent). In composition according to granular size the sands consisted mainly of 0 to 0.2 and 0.2 to 0.5-mm. particles. Eight sands contained 0.5 to 1-mm. particles in quantities of 14 to 25 per cent.

After consideration of this investigation the author recommends for a proposed specification for mason and plaster sands: (1) the sands must consist of rock minerals resistant to weathering, containing no mica and no organic impurities; (2) the content of soluble inorganic materials (loam, clay, etc.) must not exceed 3 per cent for mason sands nor 1 per cent for plaster sands; (3) the sand shall have a density of approximately 0.70 and shall consist of up to approximately 80 per cent of particles of 0 to 0.5 mm. and up to 20 per cent of 0.5 to 1 mm. grains. Slight amounts of grains up to 3 mm. are permissible insofar as the thickness of the plaster or mortar allows; particles of larger size are not permissible except in exceptional circumstances.—H. Burchartz in *Tonindustrie-Zeitung* 56:520-521, May 4, 1932.

How Calcium Sulphates Hasten Action in Lime

When lime is slaked in the presence of calcium sulphate the speed of hydration and the increase in volume ordinarily observed when lime is hydrated are considerably reduced. This was noted several years ago by Ferrari, who explained it by assuming the formation of a basic sulphate, which then decomposed to yield the hydrated lime. This hypothesis, however, does not seem to be necessary, and the author explains the phenomenon thus: that in the presence of calcium sulphate the hydration of the quicklime takes place without preliminary solution, according to a process identical with the hydration of the cementing materials—a temporary supersaturation in free lime—quicklime being more soluble than the hydrate, as an instable form is more soluble than a stable form—from which the hydrate then crystallizes.

A series of tests, expressing the results in grams of free lime per liter, was made by mixing and agitating for various periods of time quantities of quicklime in calcium-sulphate solutions in varying concentrations; also in one series hydrated lime in a saturated solution of calcium sulphate. The results show that the degree of concentration in $CaSO_4$ has little influence on the supersaturation of the free lime, and that there is no supersaturation when completely hydrated lime is shaken with the calcium-sulphate solution. There is, thus, no need to assume the temporary intermediate formation of a basic salt to explain the retarding of the hydration. These observations were made with a lime calcined at a low temperature which in the absence of calcium sulphate slakes immediately; the calcium sulphate retards the hydration and reduces, but does not eliminate, the increase in volume, so that it seems that only a part of the quicklime dissolves before hydrating.—Henri Lafuma in *Revue des Materiaux de Construction* No. 271, pp. 133-134, April, 1932.

Recent Patents

AMERICAN

Concrete

Truck concrete-mixer. Gebhard Jaeger, Columbus, O., assignor to Jaeger Machine Co., same place. No. 1,861,416.

Crushing and Grinding

Process for reduction of phosphate rock. John D. Morgan, Maplewood, N. J., assignor to Doherty Research Co., New York, N. Y. No. 1,861,236.

Apparatus for reducing rock and other mineral substances. James M. Mitchell, Flushing, N. Y. No. 1,861,-315.

Stone crusher. George E. Krider, Hollidaysburg, Pa., assignor to McLanahan & Stone Corp., same place. No. 1,861,348.

Drilling

Stoper drill. Gustave M. Nell, Detroit, Mich., assignor to Chicago Pneumatic Tool Co., New York, N. Y. No. 1,860,945.

Stoping machine. Gustave M. Nell, Detroit, Mich., assignor to Chicago Pneumatic Tool Co., New York, N. Y. No. 1,860,946.

Excavating

Power shovel. William W. Sloane, Chicago, Ill., assignor to Goodman Mfg. Co., same place. No. 1,861,194.

Materials-Handling

Apparatus for handling molders' sand. George F. Royer, Wilkes-Barre, Pa., assignor to Royer Foundry & Machine Co., same place. No. 1,860,481.

Screening

Screening apparatus. George F. Royer, Wilkes-Barre, Pa., assignor to Royer Foundry & Machine Co., same place. No. 1,860,480.

FOREIGN

Blasting and Explosives

Process for making electrical time and instantaneous fuses of all kinds. W. Eschbach. British 371,596.

Method of treating chlorates for blasting purposes. W. W. Triggs (Finska Elektrokemiske Aktiebolaget). British 372,281.

Crushing and Grinding

Apparatus for cleaning co-acting rollers used for grinding purposes. J. W. Mitchell and J. N. Mitchell. British 372,444.

Grinding mills. E. Kutaszewicz. British 372,661.

Grinding mill. F. L. Smidth & Co., New York, N. Y., assignee of Johan S. Fasting, Valby, Denmark. Canadian 323,116.

Drilling

Valve mechanisms for rock drills. Ingersoll-Rand Co., New York, N. Y. Canadian 322,299 (assignee of Fred M. Slater, Easton, Pa.), and 322,300 (assignee of William A. Smith, Sr., Easton, Pa.).

Rotary machine for well-drilling apparatus. National Supply Corp. British 372,475.

Subaqueous drilling equipment. W. D. Grant. British 372,898.

Materials-Handling

Conveyor. Karl Heinemann, Dresden, Germany. Canadian 322,586.

Underframes and buffer beams of quarry cars and the like. W. G. Allen & Sons (Tipton) Ltd., A. Weddell and W. T. Tolhurst. British 372,361.

Hopper cars. C. Ritson. British 372,461.

Conveyors. H. W. Burgoyne and British Mathews, Ltd. British 372,-480.

Jigger conveyors. E. Ridgill. British 372,610.

Conveyors. B. E. Ellson. British 372,863 and 373,090.

Belt conveyors. G. Senior, J. Sheppard and R. J. Sutcliffe. British 372,-880.

Body of a quarry car or the like, and analogous receptacles, such as buckets adapted to travel on overhead ropeways. W. G. Allen & Sons (Tipton), Ltd., A. Weddell and W. T. Tolhurst. British 372,885.

Apparatus for conveying and for depositing material. B. E. Ellson. British 372,906.

Belt or band conveyors. F. J. West, E. West and West's Gas Improvement Co., Ltd. British 372,945.

Pit-car loader. Jeffrey Manufacturing Co., Ltd., Ville La Salle, Que., assignee of Nils D. Levin, Columbus, Ohio. Canadian 322,888.

Cargo-unloading apparatus. Robins Conveying Belt Co., Passaic, N. J., assignee of R. W. Eichenberger, Chicago, Ill. Canadian 322,915.

Sacking

Machines for filling valved bags with powdered or granular material. W. W. Triggs (Bates International Bag Co.). British 369,724.

Weighing and packing of pulverulent material. K. Middelboe and N. Nielsen. British 370,185.

Manufacture of multi-ply bags. Barflett Arkell, New York, N. Y. Canadian 321,512.

PIT AND QUARRY *will furnish, at its actual cost, a copy of any patent cited here. A charge of ten cents per copy is made by the U. S. Patent Office, Washington, D. C., and readers may procure a copy directly by addressing the Commissioner of Patents, with payment for copies requested. Postage stamps are not accepted by the Patent Office. We will endeavor to obtain copies of foreign patents for our readers but we cannot give assurance in every case for the reason that copies of such patents are not printed for distribution as liberally as are the American copies, nor is there a fixed charge per copy.*

Screening and Separating

Apparatus for separating water from dredged material. D. Verstoep. British 372,462.

Apparatus for grading gravel and like materials. J. Cross. British 372,532.

Pneumatic apparatus for the separation and grading of solid pulverulent material. C. Chapman & Co., Ltd. British 372,600.

Means for separating solid materials. F. S. Sinnatt and L. Slater. British 372,759.

Apparatus for the electrical precipitation of suspended materials from gases. Lodge-Cottrell, Ltd. (International Precipitation Co., Inc.) British 372,883.

Washing

Apparatus for washing sand, gravel, and like materials, or mixing tarred macadam and concrete. J. Cross. British 371,599.

Unclassified

Coloring of asbestos cement and other products. Turners Asbestos Cement, Ltd. British 372,682.

Manufacture of artificial stones. Georges Brighenti, Lyons, France. Canadian 322,769.

Concrete building unit. MacGlashan Corp., assignee of William H. Crume, Dayton, Ohio. Canadian 323,096.

Process for the decoration of asbestos cement. L. De Lattre. French 721,071.

Process for coloring products of asbestos cement or of any materials composed of cementing materials along with fibrous substances. Soc. Anon. Francaise "Eternit." French 723,232.

Centrifugal pumps for removing insoluble substances, for instance, sand. L. F. DeGraaff, J. Lels and B. J. M. Hoogerwerff (trading as Hoogerwerff & Co.). British 369,966.

Refractory brick, and method for manufacturing them. R. P. Heuer. British 370,013.

Mortar. J. H. Frydlender. British 370.285.

Method of leaching phosphate rock. Kunstdunger - Patent - Verwertungs Akt.-Ges. British 370,706.

Magnetic separator. Exolon Co., Blasdell, assignee of Fred R. Johnson, Hamburg, N. Y. Canadian 321,-875.

Representatives Named in East, Midwest Districts

The Williams Patent Crusher & Pulverizer Co., of St. Louis, announces the following appointments: Edwin D. Cassel, 1836 Euclid Ave., Cleveland, as district representative for northern Ohio. Howard D. McCullough, 304 Coleman Bldg., Louisville, Ky., as district representative for the state of Kentucky, and Starr Equipment Co., 1124 Park Bldg., Pittsburgh, as district representative for the Pittsburgh territory.

Manufacturers' Publications

Readers may obtain, without charge and without obligation, copies of any of these publications by writing directly to the manufacturers who publish them. Please mention PIT AND QUARRY *when writing.*

Bulk-Cement Unloaders

A New Fuller-Kinyon Pump. 4 p. (The Fuller Co., Catasauqua, Pa.) Describes and illustrates a pneumatic pump for loading and unloading bulk cement to and from hopper cars or barges.

Dust Collectors

Positive Dust Collection at Low Cost. 16 p. (Cat. No. 1391. Blaw-Knox Co., Pittsburgh, Pa. Dust Collector Division.) A framed, cloth-bag type dust collector offered at a low initial cost is featured in this new booklet. Details of the collector itself are described and illustrated, and drawings depict typical installations. Contains an easy-to-understand table of dimensions and specifications, and lists supplementary equipment.

Excavators

"Making Cement in the Philippines." 2 p. (*The Ground Hog*, Vol. 7, No. 2. Marion Steam Shovel Co., Marion, O.) Describes by text and illustrations the use of excavating equipment in the quarries of the Cebu Cement Co. at Naga, Cebu, P. I.

Gypsum Lath

Facts About Gypsum Lath. 8 p. (The Gypsum Assn., Chicago, Ill.) A booklet issued to provide a clearer understanding of gypsum lath and to point out its numerous advantages. Includes specifications for erection and the results of fire, rigidity, and impact tests as conducted by responsible institutions and authorities.

Motors

Noel Polyphase Capacitor Motors. 20 p. (Bull. No. 210. The Ideal Electric & Manufacturing Co., Mansfield, O.) Describes and illustrates in complete detail the design, characteristics and construction of the Noel motor and its capacitor, which, in addition to all the advantages of the ordinary motor, is said to possess greater starting torque, a lower starting current, better efficiency and higher speed at all loads.

Power-Plant Equipment

Direct-Current Generators and Exciters. 4 p. (Bull. 1607, General Electric Co., Schenectady, N. Y.) Describes and illustrates Type B direct-current generators for general-purpose service and for field excitation. Furnished either shunt- or compound-wound in ratings of 1, 1½, and 2 kw. at 125 or 250 v.

Recorders

Southwark-Emery Stress-Strain Recorder. 4 p. (Baldwin-Southwark Corp., Philadelphia, Pa.) Describes an advanced type of recorder for use with all makes of testing machines using hydraulic pressures for load measurement. Contains photographs of the device and reproductions of typical curves as plotted and drawn by the recorder.

Screens, Vibrating

Report of Performance of Mitchell Electric Vibrating Screen. 12 p. (Gifford-Wood Co., Hudson, N. Y.) A report, including photographs, sketches and charts, of the operating performance of a vibrating screen in service handling cement clinker at a prominent cement plant.

Separators

Swendeman Automatic Separator. 16 p. (Cat. A. The Leavitt Machine Co., Orange, Mass.) Describes and illustrates an automatic device for the removal of water and oil from compressed-air lines. Drawings show suggested installations.

A Correction

The 50-ft. Dorr thickener used in the plant of the American Limestone Co., at Mascot, Tenn., described in the June 15, 1932, issue of PIT AND QUARRY, is really a hydro-separator, according to A. Anable of the Dorr Co., Inc., in that the machine recovers a settled product of a certain definite coarseness and permits the super-fines contained in the feed to overflow to a drag tank.

The operating speed of the thickener should have been given as 0.132 r.p.m. instead of 1 r.p.m. This is the standard speed of a thickener of this type, Mr. Anable declares.

Pumpings from the Old Pit

Excerpts from the old files of PIT AND QUARRY *reveal many interesting activities of former days. These are printed in this column each issue.*

Fifteen Years Ago

PLANS for dredging gravel from the Scioto and Ohio Rivers were announced by the Portsmouth Sand & Gravel Co., of Portsmouth, O., following the purchase of dredging equipment.

* * *

The Conkey Coal Co. of Mendota, Ill., operating several aggregates plants in northern Illinois, purchased the sand-and-gravel plant of the A. W. Lehrke Co. near Rockford.

* * *

Ten Years Ago

PREDICTIONS of eastern producers that an active demand for materials would develop by the summer of 1922 were more than realized —so much so that an actual shortage of crushed stone, sand and gravel prevailed in the New York area. A strike of quarry workers in New England augmented the already heavy demand and Long Island and New York State operators were working night and day in an attempt to fill orders.

* * *

Practically all cement plants in the Lehigh Valley region advanced the wages of workmen. The Atlas and Lawrence organizations were the first to raise the rates of pay followed closely by the Lehigh, Giant and other companies.

* * *

A. S. Sorenson was elected vice-president of the Illinois Concrete Aggregates Assn. at a meeting held in Chicago. Mr. Sorenson succeeded G. P. Longwell, who resigned.

* * *

Five Years Ago

A REPORT, which never advanced beyond the rumor stage, hinted that negotiations were in progress for the acquisition by the International Cement Corp. of the Lehigh Portland Cement Co.

* * *

The new cement plant of the Lawrence Portland Cement Co. at Thomaston, Me., was nearing completion and first production was scheduled for late in 1927.

* * *

The initial shipment of crushed stone was made from the new plant of the Quinn Stone & Ore Co., Ltd., at Fort William, Ontario, Can., the cargo going to a Detroit account. The operation had an annual capacity of 750,000 tons.

* * *

Launching of the lake carrier *B. F. Affleck* took place at a Toledo, O., shipyard where the boat was built. The vessel, named in honor of the president of the Universal Portland Cement Co., was to be used in transporting limestone from northern Michigan quarry ports to the cement company's plant at Buffington, Ind., on the southern shore of Lake Michigan.

New Machinery and Supplies

Flexibility Attained in 1-Cu. Yd. Power Shovel

The Keystone Driller Co. of Beaver Falls, Pa., has produced a 1-cu. yd. machine of exceptional flexibility; which is equally useable as a 1-cu. yd. standard shovel, a 1-cu. yd. skimmer machine, a pullscoop ditching outfit and crane with clam-shell. By the use of large, V-type friction wheels in the main drum and planetary gearing, it has been possible to obtain an unusual variability in control of line speed. As a matter of fact, the operator is able to use any line speed from nothing up to 120 ft. per min. for skimmer, standard shovel and pullscoop and 160 ft. per min. for crane operation.

Carrying the same principle of design into the planetary sluing mechanism, it has been found possible to give the machine, at the will of the operator, any desired sluing speed from zero to 5¼ r.p.m. The outstanding problems of control have been solved in this way. It is practicable to get maximum efficiency with any one of the widely varying utilities offered with the machine. Roller and ball bearings are used in planetary gears, and under main drum and transmission shafts.

The six types of buckets or utilities, available with the Keystone Model 17, require only three different booms; first the skimmer-pullscoop 21-ft. double-channel boom for operating the heavy, plunger-type skimmer bucket and the characteristic line of Keystone pullscoop ditching buckets; second, the standard shovel boom, box-girder type, with split 16-ft. dipper sticks; third, the 40- to 50-ft. crane boom, lattice type, of special tubular construction. In addition, a handy extension for the skimmer-pullscoop boom, making it either 24 or 30 ft. long, enables the operator to change quickly from either skimmer or pullscoop to clam-shell operation with very little trouble or loss of time.

An exceptional nicety of control of line speeds and sluing movement makes the machine preëminently well adapted for handling structural steel in erection of buildings, bridges, etc. In the form of a crawler-mounted crane, it is thought by the manufacturer, that the Model 17 will find a ready acceptance in other fields.

The illustration shows the Model 17 equipped with 18-ft. standard shovel boom and 1-cu.yd. dipper bucket. The weight of the machine so equipped is approximately 74,000 lb. Weight with skimmer, pullscoop or crane is 61,000 lb. powered with 82 h.p. Climax Bluestreak engine.

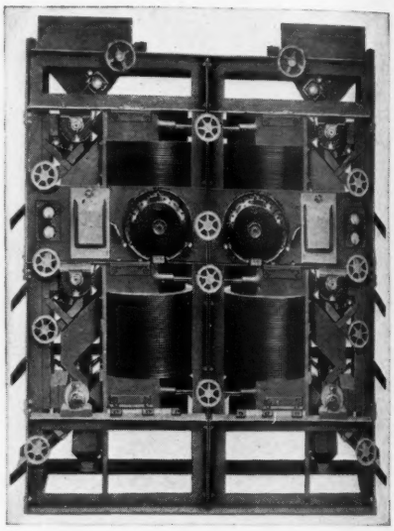
New excavator with 1-cu. yd. bucket.

New Magnetic Separator Works at High Intensity

Final tests have recently been completed on a new type of magnetic separator which has been designed to combine great capacity with a separating intensity heretofore considered unattainable. The results announced by the Dings Magnetic Separator Co. laboratories in Milwaukee specify that the machine designated as Type IR has performed the following operations:

Removed slate from coal; mica from feldspar; iron oxide from bauxite; dolomite from gypsum; oxides of iron and imbedded oxide particles from silica, sand, etc.

The economic significance of these results may affect every industry. Probably it is not generally known, but there are some forty-odd minerals in addition to iron that are magnetic to a certain degree. It is admitted that most of these materials could not be separated without the perfection of a machine with super-high magnetic intensity. As compared with the limited size and comparative high cost of previous separators for feebly magnetic materials, such a unit may be expected to work the following changes:



A four-tier, double-unit model of the new magnetic separator.

1. Enable many producers to get premium prices for improved purity in their products.
2. Reduction of cost of products or materials that now require separation as an absolute necessity.
3. Make separation and purification practical and profitable for mineral deposits never before utilized.

The accompanying diagram shows the unique, yet simple, method of producing the magnetic effect with a massive horseshoe-type electro-magnet, the pole pieces of which are tapered. Interposed between these poles and the bridge bar, or keeper, are laminated rolls, one opposite each pole. The keeper, forming the bridge bar between the two poles, has its ends shaped to conform to the curvature of the rolls. There is the minimum of clearance between the keeper and rolls to reduce flux resistance. In this manner the lines of magnetic force are concentrated almost completely in the two air-gaps between the rolls and the poles of the electro-magnet. These magnetic zones present a field strength of 18,000 *gauss*.

The material to be separated flows by gravity onto the upper induced roll. As this roll is made of magnetic iron, the magnetic portion is drawn to the surface of the roll where it is held

until the roll passes bottom dead-center. The separated material drops off the surface of the rotating roll when the lines of force are reversed and it is carried away by an inclined chute.

In most instances, even with the most feebly magnetic substances, the first roll will remove the majority of the magnetic portion. Yet, to secure extra refinement, the non-magnetic portion passes downward and is again subjected to the same separation process on the second roll.

The machine shown in the photograph is a 4-high double unit with a total of 40 feet of separating zone. For such materials as silica sand, it is rated at approximately 8 tons per hour. Thus, it is some eight times larger than any previous super-high intensity separator.

All material is given four passes through the magnetic zone. In all separations repeated passes bring out additional magnetic material until the amount is infinitesimal. This can be understood by considering cases where a tiny particle of magnetic material is attached to a bit of the non-magnetic substance. It may fall on the first roll so that the particle of magnetic material does not touch, and it will get by. On the second, it is again an even chance that the particle will fall in the right position. In passing over four rolls the law of probabilities allows even the most minute magnetic particles only one chance in sixteen of getting by.

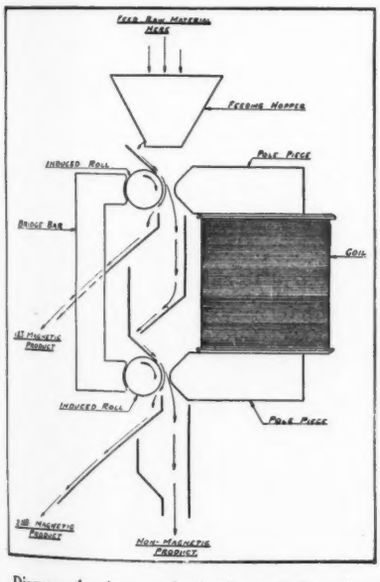


Diagram showing method of producing the magnetic effect.

The makers call attention to the fact that by using the horseshoe-type electro-magnet there is practically no straying of lines of magnetic force and all force can be concentrated where it is used. By using a great number of turns and a relatively low ampere winding, they have attained a uniformly low current consumption. Likewise, the use of anti-friction bearings on all rolls and the elimination of intricate belts and gears help make the mechanical load low.

The portable troughed-belt feeder.

Magnetism, like lightning, has a tendency to emanate from edges and points, thus the rolls are built up of laminations of soft magnetic iron which intensify the force at the surface of the rolls. Dividing boards with very sensitive adjustments are arranged under the rolls, as this is a vital point in the operation of the machine.

Engineers who worked on the design of this new separator report some interesting experiences. When power was first turned on in one of the early experimental models, the force was so tremendous that the structural frame supporting the magnet was drawn out of shape. This tendency was conquered by using stronger members welded together and made of non-magnetic metals.

It has been mentioned above that successful tests have been performed in separating dolomite from gypsum. Curiously enough, both of these materials are feebly magnetic; yet, because dolomite has a slightly greater attractive force, it is possible to separate it from the gypsum.

Portable Troughed-Belt Feeder Unloads Quickly

A further addition has just been announced to the line of material-handling equipment designed and built by The Fairfield Engineering Co., Marion, O. This time it is a low-priced portable belt feeder intended especially to facilitate the speedy unloading of loose bulk materials such as sand, gravel, crushed stone, coal, coke, etc., from hopper-bottom cars.

The feeder receives the material as it drops from the hopper, carrying it for further distribution to a portable or stationary conveyor or elevator.

The feeder is 18 in. wide and 14 ft. long. It is powered by either a 3 hp. electric motor or a 4½ hp. air-cooled gasoline engine, as desired. The rubber belt is 18 in. wide, fitted with flat cleats on close centers. The belt edges are amply protected. Replaceable wear-angles, fitted to the frame of the feeder, hold the belt in position at the curved section of the feeder. The carriage wheels are mounted on spindles that can be lowered as much as 8 in. to compensate for inequalities in the level of the ground surface where the feeder is used.

Drive from the power unit to the head shaft is through a series of steel-roller drive chains running over a series of machined sprockets. Complete pressure lubrication is provided throughout.

The unloading capacity of the Fairfield portable troughed-belt feeder is as follows: 40 tons of coke per hr.; 60 tons of coal per hr.; and 100 tons of sand per hr.

This new Fairfield development, regardless of its low price, is carefully designed, sturdily constructed, light in weight, easily moved, has ample operating capacity, and calls for very little power to operate. The machine weighs 1,350 lb.

Develops New Line of Free-Running Powders

A series of explosives of a radically new type, known as "Red Cross Blasting Nos. 2, 3 and 4 F. R.," has been developed by the explosives department of E. I. du Pont de Nemours & Co., Wilmington, Del.

These so-called free-running powders actually are dynamite of special grades in loose form. They are particularly designed for use in sprung

holes and Red Cross No. 2 F. R. is especially adapted for replacing black powder in this work. Field experience shows that 60 to 75 lb. of the free-running powder will replace 100 lb. of black powder. Nos. 3 and 4 F. R. are well adapted for top loads in certain types of well drill work where they have the advantage over regular cartridge dynamite in that they completely fill the hole because of their free running characteristics. Red Cross Blasting No. 4 F. R. is of considerable advantage for road work, as many contractors are using air drills and loading the holes with the stick dynamite, which is a relatively slow process.

While the free-running powders do not have any particular water resistance, experience indicates that they may regularly be used where black powder fails because of moisture conditions.

The most economical way to detonate free-running powders is by means of an electric blasting cap with a primer of at least 40-per cent. strength.

Improved Welding Rod Made for Stainless Steel

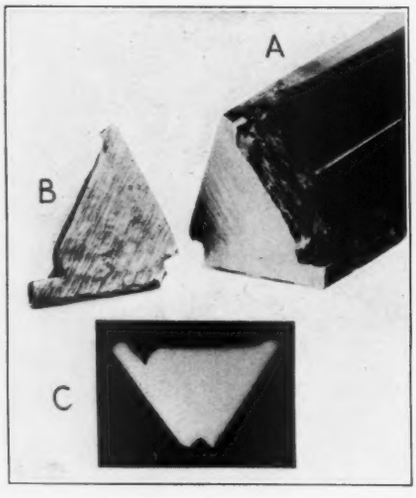
A new Allegheny metal welding electrode has just been announced by Joseph T. Ryerson & Son, Inc. The rod is applicable to Allegheny Metal and other stainless steels in the 18-8 chrome nickel group. From tests and experiments that have been made, the fact has been definitely established that the rod will give uniform, highly satisfactory results.

Chiefly responsible for its rather unusual performance is the special flux coating. This coating produces a non-active gas which surrounds the hot metal and prevents the oxygen of the air from attacking the metal and forming oxides. The heavy slag formed on top of the weld acts as a protective agent as the metal cools.

Past difficulties in welding stainless steels have in most cases been traced directly to the coating of the rod employed. The rod with high carbon in the coating produced sound welds, but in the welding process the carbon was transferred to the bead, thereby reducing corrosion resistance. Thick coating on the rod formed a heavy slag which had to be removed before laying another bead. And when using a rod with thin coating, the slag formed was not sufficient to give the molten metal complete atmospheric protection. However, all of these objectionable factors have been entirely eliminated in the new Ryerson rod.

When welding with the improved electrode, it is unnecessary to remove the slag before the next bead is laid down. This enables the operator to work faster and at the same time secure better penetration. Repeated tests indicate carbon increase in bead of about .01 per cent. as compared to the original rod. Thus the corrosion resistance of the deposited metal remains equal to that of the parent metal, leaving the weld soft enough for machining.

The illustration shows a V-type fill of eight layers placed one on top of the other without removal of any slag. Piece marked "A" is the welded material from which section "B," ⅛-in. thick, was hack saw cut across weld. "C" is an X-ray picture of "B," showing the perfect bond between the rod and work. It will be noted that there are no blow holes, or gas or slag pockets.



Illustrating the uniformity of the weld.

New Incorporations

THE DAKOTA QUARTZITE CO., Sioux Falls, S. D. Capital $25,000. J. C. Parliman, H. J. Gallagher and E. R. Gallagher.

ACME SAND & GRAVEL CO., Shreveport, La. J. E. Juban, 1600 Dickinson St., Shreveport; C. M. Brough, Yazoo City, Miss.; J. F. and Nina V. Jones, Vicksburg, Miss.

NORTH MIDDLESEX WASHED SAND & GRAVEL CO., INC., Groton, Mass. Capital $10,000. Marion K. Pierce, president; George H. Pierce, treasurer; Adelard A. Roy.

LAKE GENEVA SAND & GRAVEL CO., Lake Geneva, Wis. 200 shares @ $100. A. C. Thorson, C. D. Stevenson and W. Seymour.

R. R. JANES GRAVEL CO., Austin, Tex. Capital $10,000. R. R. Janes and C. W. Janes.

CHARLES BLACK SAND & GRAVEL CO., Hammond, La. Capital $10,000.

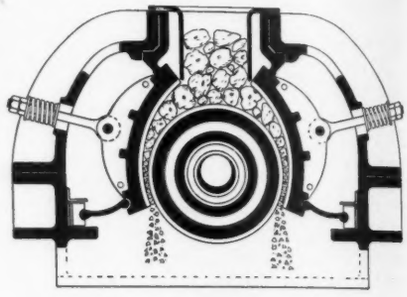
XL CONCRETE CO., Phoenix, Ariz. Capital $30,000. Thomas Schuster and Samuel Mayes, 426 South 16th Ave.

CITY SAND & GRAVEL CO., INC., Fitchburg, Mass. Capital $15,000. Alfred Ouellette, 158 Boutelle St., Fitchburg, president, treasurer; Viola Ouellette and Onesime Ouellette.

Pacific Maker Presents New Reduction Crusher

The Alloy Steel & Metals Co., Los Angeles, Cal., announces that, after several months of severe field testing and duty, it is offering to the sand, gravel and crushed-stone trade an improved form of reduction crusher. This reduction crusher will be marketed under the trade name of Pacific reduction crusher.

The principle of operation embodies an oscillating cylinder or mantle so arranged as to deliver a crushing force in all directions against two curved manganese concaves. Material



Cross-section of the crusher. The mantle does not revolve.

entering the top of the crusher flows downward on both sides of the mantle, which does not rotate, and is crushed by true compression without the usual rubbing or abrasive action. The elimination of wear lengthens the useful life of cylinder liner and concaves and materially reduces the cost of manganese replacements.

A special feature not found in other crushers, and of utmost value to operators who must furnish rock of different sizes, is the fact that the Pacific reduction crusher can be set to produce two different sizes of rock in one operation. One side may be set for fine material and the other for a coarser product.

High capacity is obtained because crushing takes place on both sides. The product is of a remarkably high quality due to the true compression action in crushing, which minimizes the production of fines. The curved surface of the mantle and concaves, both of which are corrugated, tends to break up slabs. The short, rapid strokes produce a material uniform in size and decidedly cubical in shape. With a crusher set to produce a certain size of rock it will deliver a product running a maximum of desired size with practically no oversize and a small percentage of fines.

The Pacific reduction crusher is ruggedly built, is without gears, countershaft or oil pumps and has but one moving part, an unusually large eccentric shaft of great strength. At the present time production is con- 4½ by 36, having capacities of 35 and fined to two sizes, a 4½ by 24 and a 50 tons per hour respectively of 1-in. material.

Saving Through Safety

Trophies for Pacific Coast Start Journey

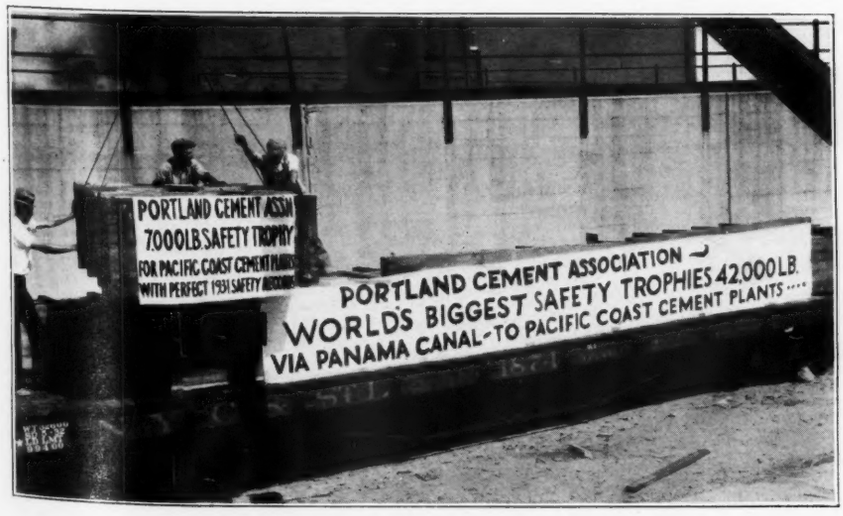
Six Monuments Are Shipped by Rail and Water for Erection at Plants Along West Coast

WHAT was probably the greatest single shipment of safety trophies for any industry was made recently from Chicago, when a freight car was loaded with 42,000 lb. of concrete safety trophies, destined for member plants of the Portland Cement Assn., located on the Pacific Coast. This single carload shipment was made by way of New Orleans, where the 7,000-lb. individual trophies were to be hoisted aboard a freight steamer, to be transported *via* the Panama Canal and delivered at various Pacific seabcard points.

The accompanying photograph shows a section of one of the 7,000-lb. trophies being loaded at the factory. Each of the trophies is approximately 8 ft. square and 3 ft. thick. They are cast in two sections, which are cemented together when erected on the plant grounds.

The trophy is of concrete manufactured from Mount Airy granite and white Portland cement. A separate plaster mold was made for each monument and the cement mixture is vibrated when in the mold to secure high strength and density. When finished, the trophies are hand-honed to a smooth, glass-like finish.

The original design for these trophies was made at the Art Institute in Chicago, by a prominent sculptor in 1923. Since that year these trophies have been awarded regularly, and now there remain but 42 member plants of the association which have not as yet received this high honor.


PORTLAND CEMENT ASSN
7,000 LB SAFETY TROPHY
PORTLAND CEMENT ASSOCIATION
WORLD'S BIGGEST SAFETY TROPHIES 42,000 LB.
VIA PANAMA CANAL-TO PACIFIC COAST CEMENT PLANTS

Loading the car with trophies for shipment to West Coast.

Ceremonies Mark Award of P. C. A. Safety Trophy

Formal dedication of the Portland Cement Assn. safety trophy took place June 8 at the plant of the Glens Falls Portland Cement Co., at Glens Falls, N. Y. J. R. Fairman, manager of the eastern offices of the Portland Cement Assn., unveiled and presented the trophy while George F. Bayle, Sr., president of the Glens Falls Company, made the acceptance address.

Accident-prevention work at the Glens Falls plant is under the supervision of Edward H. Parry, safety director, and in the five years during which the campaign against mishaps has been carried on a steady reduction of the accident rate has been accomplished. In 1925, before safety work was begun, there were two fatalities and 42 accidents causing lost time at the plant, but since that time there have been no fatalities and a constant decrease in the number of accidents.

While the trophy which was awarded the company is for the year 1931, actually the no-accident record at the plant dates back to November, 1930. On the day of the dedication the plant had experienced 561 consecutive days with no accidents causing employees to lose time, and the last accident which did occur was a minor one, causing a workman to be off the job about ten days.

How to Conduct an Investigation of . . . . Your Plant Accidents

By R. R. HOWARD
National Safety Council

WHEN an accident happens in your plant it means that there has been some sort of breakdown or failure in your work program. Something has gone wrong. Either some machine or mechanical appliance has not been properly guarded, or some working process has not been properly planned from the viewpoint of safety, or there has been some human failure in the observation of safety precautions.

This view of accidents makes a distinction between an *accident* and an *injury*. This view assumes, as previously stated, that an accident happens when something goes wrong with the work program. The "accident situation" may result in a slight injury to a worker, or a serious injury, or even a fatality. Or it may result only in damage to a machine or materials.

From this viewpoint every accident which occurs is important, because a certain accident situation, 19 times out of 20, or even 99 times out of 100, may cause only a slight injury to a worker or only slight damage to equipment or material, but the 20th time or the 100th time this same accident situation may result in a serious injury or a fatality.

This view of accident places a different kind of emphasis on the plant safety job. It emphasizes the need for careful tabulation of every plant accident: first to show the plant trend in accident situations; and, second, so that every important situation (even though the injury or the property damage has been only slight) can be thoroughly investigated in order, if possible, to fix the responsibility for the accident situation and to remove the cause or causes. The practical question is how best to investigate your plant accidents.

The chief purposes of accident investigation may be summarized under three headings:

1. To ascertain the cause or causes, so that measures may be taken to prevent similar accidents. These preventive measures may include mechanical improvements, better supervision, instruction of workmen, and sometimes discipline of the person found responsible.

2. To secure publicity among the workmen and their supervisors, for a particular hazard and for accident prevention in general, by directing attention to specific accidents and causes and results.

3. Many accident investigations have as their principal or sole purpose the ascertainment of facts bearing on legal liability. Such investigations will not always suffice for accident-prevention purposes. An investigation for preventible purposes may, however, disclose facts that are important in determining liability.

Depending on the importance of the accident and other plant conditions, the investigation of the accident may be made by one or more of the following:

a The foreman.
b. The safety engineer or inspector.
c. The workmen's safety committee.
d. The general safety committee.
e. A court of inquiry, board of inquiry, or jury.
f. In accidents involving special features it is often advantageous to call in an engineer from the insurance carrier or state department to assist.

The Foreman.—The foreman naturally will be expected to make an immediate report of every accident in his department. If statements are made regarding causes and possible remedies, they should be based on a thorough-going inquiry made immediately after the accident.

If further investigation is made by some higher authority, the responsibility of the foreman should be clearly brought out. In many companies the foreman is held entirely responsible for everything going on in his department, just as the plant manager is often held responsible for his plant. The foreman is on the ground, he probably saw the accident and knows more about it than any one else; and it is up to him, in most cases, to put into effect whatever measures may be adopted to prevent similar accidents.

Where there is a safety department, the representative—usually known as the safety engineer or safety inspector—naturally will make an investigation of every important accident or near-accident. A near-accident that might have caused death or serious injury is as important from the viewpoint of safety as an accident. The breaking of a crane hook or a scaffold rope—or two trains running in opposite direction on a single track and stopping just in time to avoid collision—such occurrence are accidents whether anyone is hurt or not.

Nowhere is the ability and the value of the safety engineer better shown than in the study of an accident or a near accident. The safety engineer should be qualified to question, fairly and considerately and kindly, all those who witnessed the accident. He should examine the scene of the accident and all equipment involved with persistence and with analytical imagination. He should go to the very root of the matter and uncover all contributing causes, including personal factors which may have led the worker to be inattentive or reckless. He should hold to no preconceived theory, should not shield a friend, should speak only the truth with the single purpose of preventing future accidents. He should present a report that is brief, fair and convincing.

Workmen's safety committees handle the investigations at many plants.

Workmen's Safety Committee.—In many plants one of the important functions of the workmen's safety committee is the investigation and reporting all accidents, or at least all important accidents. This is especially important in cases where the injured man is believed to have been at fault.

If this committee, composed of his fellow workmen, investigates the accident immediately, finds that the injured man was in fact chiefly responsible for the accident, and so reports to the general safety committee or other authority, and if such report is then published broadcast through the plant, it will create a much deeper impression among the workers than a similar report made by the foreman or the safety inspector.

General Safety Committee.—Many plants, especially those of small or moderate size, have a general safety committee which naturally handles accident investigations. As a part of their regular order of business they receive reports of all accidents occurring since the previous meeting and the committee then makes further inquiry in the cases of importance. Sometimes the workman and also the foreman are brought before the committee. This plan is especially effective where the worker or a supervisor is found at fault, since the general safety committee usually includes representatives of all plant departments and interests.

Other Agencies.—A good many large plants have developed a *court of inquiry*, a *board of inquiry* or a *jury* to investigate all important accidents. This body may consist of the foremen only, the operating executives only, or it may include foremen and workmen of the department where the accident occurred. The purposes of these courts of inquiry is to investigate thoroughly all accidents, to impress on every one present the seriousness of these accidents, as well as to give the men taking part a lasting impression of the importance of accident prevention, an impression they usually pass on to other workers. Such a court of inquiry, in addition to determining the cause of the accident, often places the responsibility and recommends discipline and suggests means for a prevention of similar accidents.

Any policy for imposing penalties upon men who are involved in accidents, of course, should have careful consideration before adoption. In many organizations penalties are imposed for infraction of operating rules and the effect generally has been reported good. It is reasonable, therefore, to suppose that a policy for enforcing a penalty upon a man who causes an accident also is a good one. The fear of such a penalty has a certain psychological effect.

Safety rules are thus made as important as any other operative rules. When such a plan once is started, there should be no exceptions in fixing responsibility and imposing penalties. Nonenforcement of a single rule breaks down the entire system.

If the accident is judged to have been caused principally by the injured man and if he has suffered a permanent injury or a material loss in wages, this is usually considered sufficient penalty. In other cases a reprimand and a compulsory lay-off for a period may be ordered. A long lay-off is generally equivalent to discharge, as the man is likely to hunt another job. A penalty sometimes used is to require the "guilty" man to address his fellow workmen on the subject of safety.

It should be emphasized in general that an accident investigation should be made as soon as possible after the accident. A delay of even a few hours may allow important evidence to be destroyed or removed, intentionally or unintentionally. The result of the inquiry also should be made known quickly, as the publicity value in safety education of all workers and supervisors is greatly increased by promptness.

Absolute fairness in accident investigation is essential. The value of the investigation is largely destroyed if there is any suspicion that its purpose or result is to "whitewash" anyone or to "pass the buck." A "verdict" which places the blame on the worker, especially on the man who was injured, is likely to be scoffed at unless the committee or jury arriving at the decision includes a generous proportion of the fellow workers who have good standing among their comrades.

Perhaps even more important is the attitude of the safety department or other company representatives in making the inquiry; no one should be assigned to this work unless he has earned a reputation for fairness and is tactful in gathering the evidence. No browbeating of witnesses, either in private inquiry or in public, should be tolerated.

Some companies have worked out a classification of personal injuries as to responsibility. The following list is used by the Illinois Steel Co.:

I. Trade Risks.
Incidental and non-preventible. (Act of God; inherent defect in material; unavoidable risk of employment.)

II. Negligence of company.
1. Failure to provide safety devices required.
2. Failure to provide proper tools or appliances required.
3. Violation of rules (by an executive).
4. Improper act, or selection of improper method of doing work (by foreman).
5. Failure to instruct men as to method of doing work and hazards involved.

III. Negligence of Workmen.
A. Injured man.
1. Failed to use safety devices provided.
2. Failed to use proper tools or appliances provided.
3. Violated rules.
4. Did an improper act, or selected an improper method of doing work (by workmen).

B. Other Workmen.
1. Failed to use safety devices.
2. Failed to use proper tools or appliances provided.
3. Violated rules.
4. Did an improper act, or selected an improper method of doing work (by workmen).

IV. Negligence of Outside Company.
Injured by outside party (railway or independent contractor).

Another helpful list which points out the nature of underlying causes that should be sought in an accident investigation has been prepared by the Accident Prevention Committee of the National Electric Light Assn. as follows:

Class of work beyond physical or mental ability of injured.
Improper tools or devices.
Lack of proper instruction.
Method pursued not suitable for work.
Protective devices not used.
Rules or instructions not observed.
Protective devices not provided.
Lack of proper inspection and maintenance (defective tools, materials, etc.).
Contributory negligence of others.
Intemperance.
Mechanical manner of doing work (lack of concentration).
Haste.
Physical condition of injured.
Poor judgment.
Wilfulness.
Conditions beyond control—(a) elements, (b) non-industrial.

This list points out the nature of the underlying causes that should be sought in any accident investigation. For example, if a number of accidents are found to have been due wholly or in part to physical conditions, such as defective vision of cranemen or engineers, this fact will constitute a powerful argument for physical examination of certain classes of employees and care in placing men in particular jobs. If personal factors such as "lack of concentration" appear prominently, a tactful inquiry may disclose a condition of worry due to illness in the family or other cause which can be helped by the visiting nurse or welfare department.

Silica Firms Enroll in National Safety Council

The growing menace of silicosis to workers about silica operations has more than ever before turned the attention of the management to safety measures and the prevention of the disease.

The National Safety Council reports that the National Silica Co., of Oregon, Ill., Standard Silica Co, of Chicago, Ottawa Silica Co. of Ottawa, Ill., and the Wedron Silica Co. of Chicago have recently taken membership in the Council.

To Manufacture Cranes and Shovels in Canada

The Stephens-Adamson Mfg. Co., of Canada, Ltd., conveyor manufacturer at Belleville, Ont., has concluded an arrangement with the Orton Crane & Shovel Co., of Huntington, Ind., for the manufacture and exclusive sale in Canada of Orton locomotive cranes, dipper shovels, pull-back ditchers, skimmers, clam-shell buckets, orange-peel buckets, traveling gantry and cantilever cranes and similar equipment. This equipment will be known as the Saco-Orton line.

Orton equipment is widely known throughout the Dominion and the Orton company feels that Canadian users can best be served by having its equipment made and serviced by a Canadian manufacturing and engineering firm.

The Stephens-Adamson factory is located at Belleville, Ont., on both the Canadian National and Canadian Pacific railroads. Sales and engineering offices are located at 926 Bank of Hamilton Bldg., Toronto, and 220 New Birks Bldg., Montreal, with sales representatives in the principal cities of other provinces.

Complete $75,000 Gravel Operation Near Seattle

Construction has been completed on the new sand-and-gravel plant of the Puget Sound Tug & Barge Co., near Seattle, Wash., and the operation, which cost $75,000 to erect including the equipment, is scheduled to go into production shortly.

Storage facilities at the plant can care for 5,000 cu. yd. of washed and screened products and the plant has a capacity for processing 1,400 cu. yd. per 8-hr. shift, according to George Cary, vice-president.

Installs Gravel Plant on Cumberland River

The Sangravel Co. of Paducah, Ky., is installing a plant at Kuttawa, Ky., which, when completed, will have a capacity of 30 carloads of sand and gravel per day.

Material will be excavated from the Cumberland River and shipped by barge and railway.

Silicosis Claim Against Illinois Concern Denied

After deliberating for half an hour a jury, in the case of Russell Keller, of Elco, Ill., against the Tamms Silica Co., of Anna, Ill., in which Keller sued for $25,000 damages, claiming his health was ruined by the silica dust, rendered a verdict in favor of the company.

The jury was convinced that his condition was due to tuberculosis and that his work in the silica was not responsible for the condition of his health. Respirators were provided for the protection of employees and suction fans helped to protect employees from contact with the dust. It was the fault of employees if they failed to use the respirators, the jury concluded.

Factory
Kingston,
N. Y.

FOR MATERIALS REQUIRING FINE SEPARATION

THE NEW MODEL "28" GAYCO, with its improved mechanical construction, offers **greater capacity, cleaner tailings, more uniform product,** and **higher efficiency** than is possible with any other air separator. **Quick, positive adjustment** for any mesh. **Automatic** lubrication. **Steep angle cones** preventing material building up and choking. **No dampers, no choke deflectors.**

Send Sample Material for Free Test

Catalogue on Request

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DIVISION OF UNIVERSAL ROAD MACHINERY CO., KINGSTON, N. Y.
Manufacturers of "RELIANCE" Crushing, Screening and Washing Equipment

"We've loaded 750 yds. in a day with our HAISS 80"

That quarry owner's problem is yours, too,—to load FAST when he is rehandling stone from his storage piles. Minutes count! The big "80" Haiss Loader is the fastest loading machine you can pick for a job like this. IT WILL CUT YOUR STORAGE PILE LOADING COSTS.

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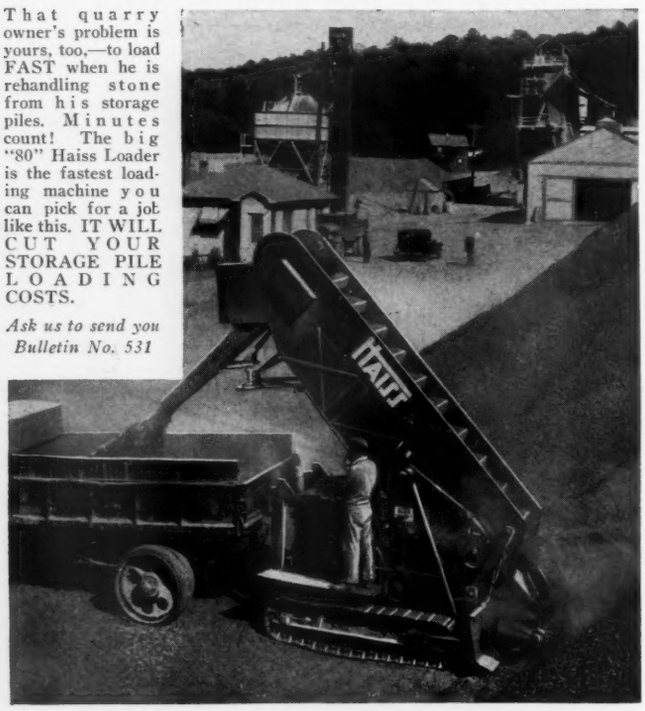

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JIGS—For concentrating and beneficiating hematite and manganese ores.

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McLanahan & Stone Corp.
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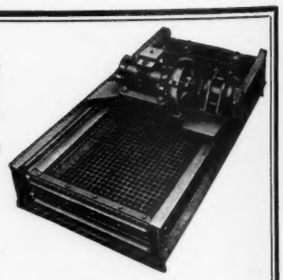
THE Leahy HEAVY DUTY



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One large company operating nineteen plants—all Leahy equipped—says the following regarding the Leahy Screen: "We have standardized on this screen because we have been able to rely upon it for economical, dependable, and satisfactory service."

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Single $2.50 *and up*
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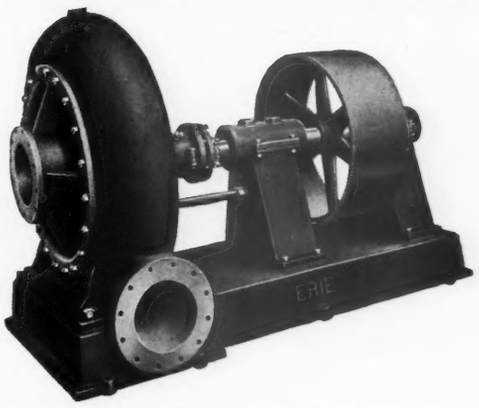
CASS AND BAGLEY AVENUES

Consider the Shell



Shells of Erie Dredge Pumps are furnished according to the type of work required. The regular construction is of a very hard semi-steel castings, made in our own shop. For more rugged work, a much harder metal, called NICRU, is used. Pumps are also made with manganese steel castings, when very sharp abrasive materials are encountered. The shell is another reason why Erie pumps have a longer life, and will run with lowest power and other maintenance costs.

ERIE PUMP & ENGINE WORKS
153 Glenwood Ave. Medina, N. Y.

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Research Department

538 South Clark St., Chicago, Ill.

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- ☐Air cleaners
- ☐Air compressors
- ☐Bag filling and weighing machinery
- ☐Bags, cloth
- ☐Bags, paper
- ☐Balls, steel
- ☐Barges, steel
- ☐Belt dressing
- ☐Belt fasteners
- ☐Belting, conveyor and elevator
- ☐Belting, transmission
- ☐Belt lacing
- ☐Belt plates
- ☐Belt rivets
- ☐Belt tighteners
- ☐Bin gates
- ☐Bins, concrete
- ☐Bins, steel
- ☐Blasting supplies
- ☐Blasting powder
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- ☐Boats, self-unloading
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- ☐Brake Linings
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- ☐Buckets, Conveyor and Elevator
- ☐Buckets, Dragline
- ☐Buckets, Orange Peel
- ☐Cableways, Slackline
- ☐Calcining Machinery
- ☐Car Dumpers
- ☐Car Pullers and Movers
- ☐Carriers, Belt
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- ☐Cars, Kiln
- ☐Castings, Manganese Steel
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- ☐Dryers, Sand and Gravel
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- ☐Elevators, Bucket
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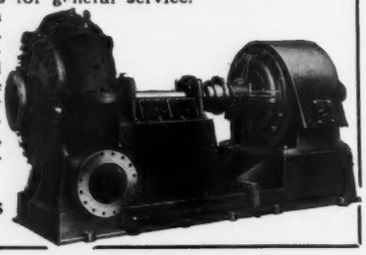
Also complete dredges with all accessory equipment. Dredging pump designs include heavy duty types and special alloy parts for severe service. Types and sizes for the largest or smallest operations, and belt, motor, steam, oil or gasoline-engine drive.



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Genuine Spring Steel Wire Cloth in Double and Lock Meshes

IMMEDIATE SHIPMENT FROM STOCK

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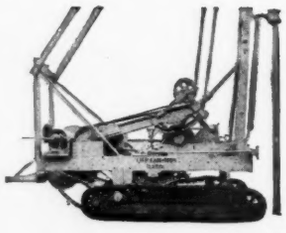

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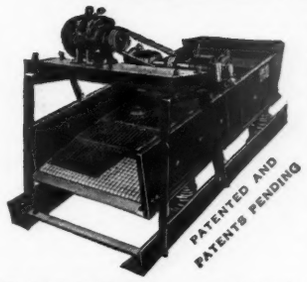

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For that "tough" job—
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All sizes — All Capacities
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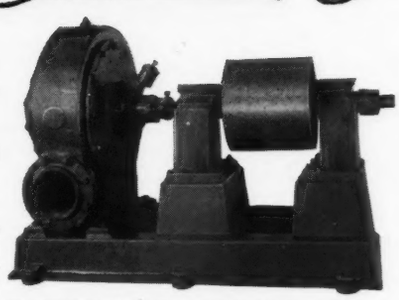
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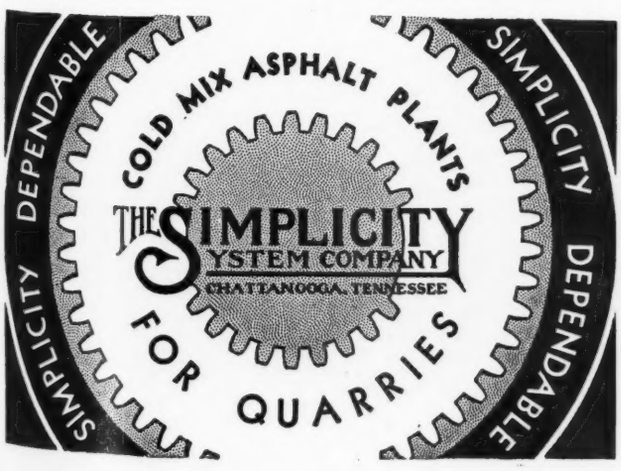

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GOOD USED CRUSHING, PULVERIZING, DRYING AND FILTERING EQUIPMENT—COMPLETE

Crushing Plants; Diesel, Gasoline, Electric Cranes and Shovels; Hoists; Compressors; Pumps; Dragline and Excavating Equipment; and all sizes and types of Jaw, Gyratory and Roll Crushers; Swing Hammer Mills; Elevators; Belt Conveyors; Rotary and Vibrating Screens; Rotary Kilns and Dryers; Raymond and other fine Pulverizers; Air Separators; Hardinge Ball and Pebble Mills; Silex and iron lined Tube Mills, etc. Send for Bulletin No. 14.

CONSOLIDATED PRODUCTS CO., Inc., 17-19 Park Row, New York City
Tel. Barclay 7-0600 Shops and Yards at Newark, N. J., now cover eight acres

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FOR SALE

NEW 84" x 60" Jaw Crusher

With 2—No. 12 Gyratory Crushers (New)
Screens—5 to 300HP—60 Cy. 3 Ph. Motors (New) etc
Box 104, Pit and Quarry, 538 S. Clark S., Chicago, Ill.

DERRICK OUTFIT

15 ton American Steel Stiff Leg Derrick, 80 ft. boom, 150 H.P. 3 drum Electric hoist, and 30 H.P. Slewer, motors 3 ph. 60 cy. 220-440 V., with or without 2 yd. Owen clam shell bucket.

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2— 8 ton Std. Ga. Vulcan Gasoline
2—20 ton Std. Ga. Vulcan Gasoline
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1—50 ton Std. Ga. Porter S.T. Loco.

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14—12 yd. Western Hand Dump Cars
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Also 1 to 4 yd. Steam and Electric Shovels, Steam Loco Cranes, and Air Compressors

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All Equipped with Asme Boilers

60-ton 18x24" Porter 6-wheel saddle tank, 200-lbs. steam. New firebox.
40-ton 14x22" American 4-wheel saddle tank, 190-lbs. steam. Two duplicates.
38-ton 14x20" Porter 4-wheel saddle tank, 180-lbs. steam. New firebox.
28-ton 12x18" Vulcan 4-wheel saddle tank, 190-lbs. steam. New firebox.
21-ton 11x16" Vulcan 4-wheel saddle tank, 190-lbs. steam.
21-ton 11x16" Vulcan 4-wheel saddle tank, 190-lbs. steam, 36" gauge.
70-ton 20x26" Baldwin 6-wheel Switcher, with separate Tender, 180-lbs. steam.

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25-ton Browning 8-wheel 50' boom.
15-ton Industrial 8-wheel 40' boom.

GASOLINE SHOVELS

P&H Model 600, 1-yard dipper.
P&H Model 206, ¾-yard dipper.

DUMP CARS

4-yard Western Heavy Duty, 36" gauge.
5-yard Western Heavy Duty, 36" gauge.
Our stock also includes many other locomotives, locomotive cranes, shovels, cars, etc. Complete list on request.

Birmingham Rail & Locomotive Company

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WE BUY—SELL—REPAIR

All Types of Electrical Machinery. Each One Rebuilt and Fully Guaranteed

ELECTRIC GENERATOR AND MOTOR CO.
Cor. E. 53rd. St. & Hamilton Ave., Cleveland, Ohio

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Sauerman Slackline and Drag Scraper Units, Steam and Electric.
Sand & Gravel Washing and Screening Equipment.
Diesel Oil Engines. 90 to 500 H.P.
Bucket Elevators.
Air Separators.
Pulverizers.
Crushers.
Screens.
Dryers.
Belt Conveyors, etc., etc.

A. J. O'NEILL CO.,
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BRAND NEW WIRE ROPE FOR SALE

⅜ in. Dia. 6x19—Galv. Plow Steel, 20,000 ft.
⅞ in. Dia. 6x19—Bright Plow Steel, 50,000 ft.
1 in. Dia. 6x19—Plow. Improved Plow and Cast Steel, 100,000 ft.
1⅛ in. Dia. 6x19—Plow Steel, 6,000 ft.

Also 9/16 in., ⅝ in., ¾ in., 1½ in., 1¾ in., 1⅞ in., 2 in. and 2¼ in. Diameter ropes.
Lengths cut to your requirements—Address

Terrence P. Wynn Company
100 West 72nd Street
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FOR SALE CHEAP

1—25 ton Ohio locomotive crane 50' boom, D.D. A.S.M.E. boiler.
1—25 ton Ohio locomotive crane 50' boom, S. D. A.S.M.E. boiler.
1—Vulcan 40 ton S.G. saddle tank locomotive A.S.M.E. boiler.
1—Chicago Pneumatic Gasoline driven portable 220' compressor.
1—Ingersoll-Rand 220' gasoline driven portable compressor.
3—8 ton Plymouth 36" gauge gasoline locomotives.
15—4 yard Koppel two way dump cars 36" gauge.
100 ton 40 and 45 lb. rail.
1—Erie Type B2—steam combination shovel and crane boom on caterpillars.
1—Erie B steam shovel on caterpillars.
1—Thew ⅝ yard gas shovel on caterpillars.
1—Browning shovel ⅝ yard with 35' crane boom.

HARRY C. LEWIS
156 Market St., Newark, N. J.

MOTOR BARGAINS

3 PHASE, 60 CYCLE

HP	Make	Volts	Type	Speed
1-800	G. E.	2300	Slip Ring	720
1-600	G. E.	440	Synch.	360
1-300	Al. Ch.	2200	Slip Ring	585
1-275	G. E.	550	Synch.	900
2-200	G. E.	2200/440	Synch.	514
1-200	Wsthse.	440	Slip Ring	500
1-200	F. M.	440	Slip Ring	600
1-200	Wsthse.	220/440	Sq. Cage	585
1-150	G. E.	550	Synch.	720
1-104	G. E.	220/440	Slip Ring	870
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15. Experienced superintendent or manager; graduate engineer; 12 years' experience in sand and gravel production and plant design.

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30. Crushing plant and quarry Superintendent. Experience includes erecting, rebuilding and repairing machinery. Successful in organizing labor for economy. References furnished.

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42. General superintendent or manager; experienced graduate engineer.

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48. Graduate Engineer. Wide experience as mining, consulting and sales Engineer, in charge of all outside operations, construction and maintenance. A-1 references.

49. 15 yrs'. experience in erecting and operation, crushing, grinding, washing, drying, screening and separation plants. Know value of low production costs. Good references.

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53. Quarry superintendent with years of experience in all operations, such as stripping, drilling, blasting, shovel loading, crushing, sinking, also repairing of all quarry equipment and familiar with all phases of washing crushed stone. Now open for proposition. Excellent reference.

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59. 13 years' experience in general office work, including correspondence, sales and operations. Well acquainted with freight rate structures on crushed stone, sand and gravel and cement. Desire connection with any concern where ability and experience would be appreciated.

60. Slackline Cableway operator. 5 years' experience. Can keep cableway operating at full capacity. Can do repair work. Had experience raising and lowering mast or tower. Can do all necessary rigging around cableway.

61. Wants position as foreman of a rock, sand and gravel, or oil-mix plant, preferably the latter. Several years' experience as foreman of oil-mix and hot stuff proportioning plant. Can furnish best of references from previous employers and contracting engineers. Will go anywhere but prefer the west or middle west.

62. Position wanted as quarry superintendent. Prefer southwest or west coast.

63. Stone Quarry Supt. or Supt. asst. 14 yrs. experience in commercial stone and railroad ballasting; operating and repairing all kinds and makes of equipment. Wide experience in drilling and blasting. A-1 references.

64. Position wanted by operator with 15 years' experience on cranes, shovels, draglines, sand pumps, dredges, etc. 35 years of age, can furnish A-1 references. Will go anywhere.

65. Graduate mechanical and structural engineer with wide experience on cement and stone plants. Permanent or temporary employment.

66. Superintendent or Foreman of Quarry and Crushing plant or Sand and Gravel plant. 30 years' experience. Can make good anywhere. A-1 references. Available now and will locate anywhere at moderate salary.

67. Successful manager of stone crushing plants, also sand and gravel pits, desires position where previous experience will prove of mutual benefit. Can also sell sand, gravel and stone products or machinery and electrical equipment.

68. Superintendent and Foreman with wide experience in operation of slag, sand and gravel and stone plants. Also experience in railroad work, road construction, grading, ditching, bridges, concrete work, all kinds of excavation, government inspection. Can operate gas and electric cranes. Best of references.

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***See also information in the 1932 Pit and Quarry HANDBOOK**